SUPPLEMENT.

The Mining Journal,

AILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

. 1903.—Vol. XLII. LONDON, SATURDAY, FEBRUARY 10, 1872. PRICE ..... FIVEPENCE. PER ANNUM, BY POST, £1 4s.

Original Correspondence.

RONWORKS AND COLLIERIES IN YORKSHIRE.

THE MANVERS MAIN COLLIERY.

development of the coal and other minerals which abound in ry parts of the kingdom, invaluable and necessary as they are national prosperity and greatness, has led as much as anything the obliteration of ancient and historical landmarks, and the ing of the scenery in very many instances from the picturesque eautiful to the unpoetical, hard, and utilitarian. In scarcely art of the kingom have those changes in the aspect of our districts been of a more marked character of late than in the Riding of Yorkshire. This will be apparent in taking the ry within ten miles of Doncaster, or nearly midway between own and Sheffield and Barnsley, several very large collieries g been opened out within the last two or three years in localities t unequalled for their beauty. Amongst them may be men- l the Denaby Main, quite close to an old ford at Mexborough, e in Saxon times the mustering took place of the men of the idred" for the exhibition of arms and armour. It is also no distance from Conisbro' Castle, and of the country around n Sir Walter Scott wrote "There are few more beautiful or ing scenes in England than are presented by the Saxon fortress." castle is an outlier of the great magnesian formation, under- which are vast and valuable deposits of coal, as yet all but ached, and extending for many miles. The distance from the stone to the Barnsley coal would be about 500 yards, and to the tone from 970 to 980 yards, and it is not going too far in saying before a great many years have elapsed both those well-known s will be worked in the locality, and great as the depths of beds will be found to be nearer to Doncaster, it is not impro- e that the neighbourhood of that town will become as famous ts "black diamonds" as it now is for its extensive moor and g carnival.

e of the largest collieries in the Riding, and where probably coal is raised daily from one shaft than in any other in the ty, is that known as Manvers Main—so called after the lessor of coal, Earl Manvers—and owned by an influential company. It tuate about half-a-mile from the handsome and ari tocratic vil- of Wath, known in the district as "The Queen of Villages," and re in early life the poet Montgomery resided for some years. colliery is about ten miles from Doncaster, the Manchester, ffield, and Lincolnshire line passing quite close to it, the Midland lway being also in near proximity. The pit and buildings were out by the late managing director, Mr. G. C. Haigh (who died n the effects of an accident at a railway station in October last), Mr. W. Gomersall, the present engineer, and the first sod turned the 21st of May, 1867, the coal being reached at the close of 9. Although the coal has been worked for more than a year, yet surface works and buildings are not as yet completed, and new es, boiler-sheds, &c., have yet to be erected. The head gear is of most massive description, and at very few places will be equalled, g made of the best pitch pine. It is 75 feet in height, and from bank to the centre of the pulleys 55 feet—the bank being 22 feet m the ground level. The pulleys, by the well-known firm of vy Brothers, of Sheffield, are 17 feet in diameter, working a nd wire-rope 5¼ inches in circumference.

The engine power is more than usually extensive, the principal ine-room, a large, well-kept, and clean building, with polished od roof, being all that could be desired. There are a pair of inch cylinder winding-engines, each of 100-horse power, with feet drums, and 6-feet stroke, by Black, Hawthorn, and Co., of ehead-on-Tyne. The coal is drawn from the dips by a pair of ines at the top, one of them being of 20-horse power and portable, the other of 18-horse power and stationary, working an ordi- y wire-rope. Preparations, however, are being made for putting n in the bottom of the pit a pair of 21-inch cylinder engines for wing, instead of those placed on the surface for bringing the coal he bottom of the shaft. A pair of donkey-engines feed the boilers h water, and a third one is kept in operation for pumping the d water into the exhaust cistern for heating. Other engines are t for different descriptions of work in connection with the shops, The motive-power is obtained by means of eight cylindrical llers, three being 46 ft. long and 5 ft. 6 in. in diameter. Some of boilers were made by Booth Brothers, Sheffield, and the others Pigott and Farrar, of Barnsley. The boiler-shed is now being ered in, and two more boilers are about to be put down.

There are two shafts, a drawing and upcast, both 14 ft. in dia- ter, The drawing-shaft is lined with cast-iron tubbing to the tent of 52 yards from the surface. Double-decked cages are used, r corves being brought up at each draw, the weight of all being cwts. The depth of the shafts are 280 yards, and the time occu- d in raising the cages to the surface is about 30 seconds. The al, which is of very good quality, is the well-known Barnsley am, being 8 ft. 6 in. thick. The other coal measures gone through fore reaching it were the Newhill coal, which varies very much thickness; thus the Wathwood, of excellent quality, and a sure ide to the Barnsley thick seam, neither of the beds varying more an some five or six yards as to distance from each other through- t the entire district, the average distance from one to the other ing about 180 yards. It is followed by the Abdy and the Kent hin and Thick seams, scarcely ever worked, and then what is locally nown as the Ten-inch seam. At Manvers Main, what is termed e top part of the Barnsley seam is 3 ft. 6 in. in thickness, and the wer one 5 ft., the former being "harda," or steam, and the other softa." The ventilation is produced by means of the ordinary rnaces, of which there are two, with patent bars, the grates being ft. by 6 ft. The system, however, will shortly be changed, as the cessary work for the putting down of a fan is being proceeded with. is now in course of construction by Messrs. Black, Hawthorn, nd Co., and is on Guibal's principle.

There are the usual shops on the top, amongst them being one uite close to the drawing shaft on the bank, where all the picks are harpened, without having to be taken some distance to the black- mith's shop, by which a considerable gain in time is obtained. The creens, of which there are 12, made by Washington, are well ar- anged for separating the nuts and smudge from the large coal; hilst connected with the cages are Ormerod's patent for disconnect- ing them from the rope, and so preventing overwinding—a very necessary appliance. Joining the temporary offices is a carpenter's shop, well fitted up, whilst a smithy with three fires is by the side of it, and in it a fan is about to be placed for blowing the bellows.

The spavin drawn out of the pit is all utilised in a very important way. Mixed with clay obtained on the ground, it is made into very excellent bricks. The materials named are ground together in a 9-foot pan with a pair of rolls, each weighing 50 cwts., and converted in the usual way into bricks, and taken into a large drying-house close to where the preliminary operations have been gone through. A pair of 12-inch cylinder engines, formerly used in locomotives, not only drive the rolls, but also some circular saws, hay choppers, &c. We may also state that there is a very fine chimney stack, 45 yards high, 12 ft. diameter at the base, and 6 ft. in diameter from the bottom of the opening. There are also weighing machines, and everything necessary for ensuring dispatch in all that relates to colliery working.

The area of the coal field is about 1340 acres, the lessor, as before stated, being Earl Manvers, and the estate is very compact, so that the coal can be very advantageously worked. More than 1000 tons of coal have been raised to the surface in an ordinary day, and the average output is about 5500 tons per week. Between 400 and 500 persons are employed, and about 700*l.* are paid in wages weekly. The district is what may be termed a new one, but as building operations are taking place in all directions it promises to be a very important one, as there are other properties around in which the minerals are yet untouched, but are about to be developed.

In conclusion, we may say that from what we have seen there can be little doubt but what the Manvers Main Colliery Company will be a very prosperous one, and we regret that Mr. Haigh, who was the life and soul of the affair from its commencement, did not live to witness its great success—a success in every way assured by its advantageous situation, being close to two lines of railway and a canal.

For many of the above facts we are indebted to the courtesy of Mr. Gomersall, the engineer, who has been connected with the works from the commencement, taking the active part in laying them out.

ON THE IMPORTANCE OF A RECORD OF VENTILATION AT COLLIERIES.

BY MR. DAVID WINGATE,

Manager at the Wellington and Sunnyside Collieries.*

The object of the brief paper which I propose to read to you is to give some description of a "Daily Record of Ventilation," &c., of which you see blank specimen sheets on the table, and, if possible, to induce you to adopt something similar at the collieries under your charge. I am not going to assert that this form of a "record" is either new or old, or the best that can be made; but that it is of the utmost importance that some such form ought to be in use at every colliery I hope to be able to convince you. I may say just now that I have used it for several years. I may also say that Mr. Moore, our Inspector, approves of, at least, the principle of it, and I may say also that at his request I have sent specimen sheets to several collieries, and I have reason to believe that a "record" something like this is already in use at other pits than those I have charge of:—

DAILY REPORT OF VENTILATION, &c., AT SUNNYSIDE NO. PIT.

Date.	Area.	Revolutions.	Feet.	Area.	Revolutions.	Feet.	Area.	Revolutions.	Feet.	Total cubic feet.	Time.	Water gauge.	Weather.	Barometer.	Thermometer	Remarks.

Perhaps I shall be excused if I refer shortly to each column in succession and in their order. My apology for so doing is simply this. It would hardly do for me to throw these blank sheets at you, and say nothing about them, on the ground that I am speaking to men who are, at least, as familiar with such things as I am, and that the mere hint conveyed by the sheets will suffice. I could not expect you to approve of such a course. I trust no one will suspect me of wishing to make a display of any sort. Some one among you may not have had his attention turned to these things, and for his sake I hope to be held excused.

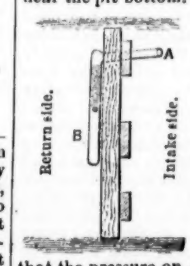
You will perceive that the instruments which must be had before the "record" can be made are a barometer, a thermometer, and a water-gauge. You will also have to measure the velocity of your air currents in some way, and for this purpose I use (because of its handiness), and advise you also to use, an anemometer. I do not say that that instrument gives results quite correct, nor so correct as at least one other method of measuring air velocities, which, in certain circumstances might be used, but it gives approximate results, is for all practical purposes sufficiently correct, and is, as I said, handy. You will note also that the outer column is for remarks. To this I think a special importance is to be attached, of which I propose to say a word further on.

Well, under the heading "area" you find "20" written all the way down. If you ask why it is always the same, the answer is because the velocity is always measured at a place whose length and breadth is unvarying, and which measures 20 square feet. You may, if it suits your convenience or fancy, have the place where the velocity is taken 40, or 100, or only 10 square feet, but the "area" should be constant. It would occupy a great deal of any man's time to have the area of an air-course to measure every time he used an anemometer, so that, as a matter of economy, the "area" should be at the place of measurement always the same. That may be dismissed as evident. As to the utility of having the area correctly measured and known it is this:—If the area of an air-way is unknown, the anemometer is of no earthly use so far as showing you the quantity of air that is passing is concerned; for instance, if I go to a place whose "area" I do not know, and hold up or set up an anemometer, and observe that it records (say) 280 revolutions per minute, what have I learned? Only that the air at that place is (supposing the instrument to be telling the truth) flowing at the rate of 280 lineal feet per minute, but nothing of the total quantity that is passing; but if the area is known I have only to multiply it into the speed, and the quotient is the number of cubic feet which are passing, 280 20=5600—a definite result instead of an indefinite. In other words, I have found that a body of air 280 ft. long, and whose length and breadth multiplied together equal 20 square feet, has travelled its own length in one minute. Of figures based on such measurements, then, the first three columns are composed—first the area, then the number of revolutions, and then the number of cubic feet.

These results are all taken by anemometer (Biram's), but if you do not wish to trust to such an instrument you can find your velocity by another, and, I think, a more correct method—that is, by ascertaining the speed at which powder smoke, or any other equally light substance, which has a strong smell, travels along an airway whose mean area is known. Suppose the distance travelled to be 60 ft., the mean area 40 ft., and the time 1 minute; in that case the calculation you'l be very simple—60×40=2400 per minute. But if the time were some fraction of a minute, as very likely it would be, the total would not be obtained quite so easily, because the velocity, whatever it was, would have to be reduced to feet per minute, as for instance:—Mean area, 40; mean length, 60; mean time, 15 seconds—that is (40×60 ×60)÷15 = 9600.

The result, you perceive, is not quite so handily obtained. Besides, one man can always manage an anemometer easily, which is not the case when powder smoke has to be fired off at a distance. The conclusion is that the anemometer is handiest. But, for the purpose of making a daily record of ventilation, it is not absolutely necessary to know the exact quantity that is passing each day, unless it be a question whether the total is beneath what is required for the use of men, horses, and lamps, and for the dilution of gases. It rarely happens, where any attempt is made to ventilate properly, that the total quantity falls beneath such requirement, though it may happen that a good total quantity is not so well distributed as it might be. So that for all practical purposes an instrument which will tell with reasonable certainty what quantity is flowing to-day, compared with what was flowing yesterday, is what is wanted for the purpose of making such a record as this, and Biram's anemometer supplies that want. As to showing whether the quantities that flow are *enough*, the record takes no note of that, though if it did it might be better. For instance, it might be a good thing to have columns showing how many men and boys, horses and lamps, are in the mine each day, and by glancing at these numbers and at the totals of air you would have a proof that the mine has been, or is, properly ventilated, or the reverse. Had I thought of it in time I should have had such entries made. *What* the total quantity for a given number of men should be is quite apart from the object of this paper. So much for the first set of three columns. The next two sets of three are similar to the first, differing only because they are records of different currents. Of the next two columns nothing seems necessary to say except that under the heading "time" you have always an answer to the question, "At what time of the day did you find such a quantity to be flowing?"

Under the heading water-gauge you find 0·10 all the way down. It could hardly have happened that our water-gauge would always record the same amount of pressure, so that in this the record is not quite faithful, but I have never found it more than 0·10, and so because less than a tenth is doubtful measurement it is always written as 0·10. As to the instrument, this little model shows the form, and these sketches on the board show how it will appear in a door or bratticing. You hang up the instrument in some convenient place near the pit bottom. It must be hung so that when in the position, shown by this sketch of an edge view of a door, the end, A, shall be on the intake side, the front, B, of course, on the return side. The air will then seek to rush from A through the tube, and would do so with greater or less force as the pressure on the area of the tube at A increased or decreased. But the water in the lower part of the tube prevents the passage of the air, and the result is that the water is displaced more or less, according to the pressure. Well, from zero on the instrument, to which point it will be filled with water, you have a scale of inches and tenths of an inch, and if the water is depressed 1 inch you know that the pressure on each square foot of the area of your air-way, at the point where the gauge is hung, equals 5·2 lbs. If you are curious to know what force in horse-power is expended on your ventilation, you have only to multiply this pressure per square foot, as shown by the water-gauge, into your total ventilation, and divide by 33,000:—as water-gauge, 5·2; ventilation, 30,000 cubic feet—that is (30,000 × 5·2)÷33,000 = 4·7 horse power.



It might be useful to have a "record" which showed *that*, but *this* does not. However, it is easy to see that if any serious obstruction occurred in your air-courses the pressure would be increased, and the water-gauge would go up, saying to the man who had charge of the air-courses "Look out! There's something wrong." There could be no mistaking of the language of the gauge in such a case, because nothing but an effort to increase the ventilation (obstructions apart) could raise the water-gauge. Again, if the water-gauge falls. Suppose it an inch just now, and in two hours hence only half an inch, what must you conclude? Only this; that the man who has charge of your furnace, or your fan, or your pump, or your steam-jet, *is not doing his duty*. It must be so, because nothing in the daily, unaltered, routine of a colliery can lower the water-gauge but a reduction of the power applied. With these things in view, it is difficult to over-estimate the value of having a water-gauge; and if you have one, by all means note its variations from day to day.

The next heading is a barometer. Well, you all, I presume, know what a barometer is—an instrument that notes the density, the weight, of the atmosphere, about 30 in. of mercury being equal to a column of air of I do not know how many miles high, nor need I stop to enquire about it. What chiefly concerns us as miners is the fact that the instruments tells us when pressure is added to or withdrawn from our working faces and from the waste of our mines. It cannot record any variation in the atmosphere without also recording the fact I have stated; hence its importance. We all know of the fact that fire-damp issues from the fissures in our coal faces, cracks, &c., in our roof and pavement, and we may easily suppose that if it were possi-

* Read before the Lanarkshire Institute of Colliery Managers, Jan. 23, 1872.

ble to oppose a sufficient force to those blowers no fire-damp would exude. No such force is known, but the fact remains that there is a power constantly opposing the issue of gas from these fissures—the pressure of the atmosphere. Well, if the pressure were constant, the gases would blow out with always the same force, and that, whether gas or air, in our waste workings would always occupy the same space; 100 ft. would, if it were always of the same sort, have an unvarying weight, and the barometer would be, as far as mining is concerned, merely a curiosity. But the density of the air varies, and with it the barometer; hence its use. If we only stop for a moment to think of the law to which all elastic fluids are subject—that the volume increases directly as the pressure decreases—we shall see that it is impossible to over-estimate the importance of having a barometer under one's eyes at a colliery. Put the space round one of your soft coal pillars at 8000 ft., and apply the law. Suppose the mercury to make a rapid fall of 2 in., what would be the result? An equally rapid increase of volume around each pillar to the extent of about 500 ft. If the whole of your pit were full of pure air no evil result could happen, but fancy a pit with a great amount of waste filled, more or less, with fire-damp, and where stooping has been going on for a long time, it is no great stretch of fancy; and think of the sudden increase of volume of a dangerous gas to such an extent. But, supposing there were no reservoirs of gas beyond the reach of your bratticing, how few of your pits are without fire-damp, which before it reaches you has been stored away somewhere in the solid about you? Upon these hidden reservoirs need I remind you that this law acts with unfailing certainty. As the barometer falls the undiluted gas rushes in greater and greater quantities, to mix with the flowing air, and become the enemy whose name is fire-damp. This is no fancy picture. How easily might it happen that the atmosphere of a fiery pit, which had mixed with it before the barometer began to fall a safe quantity of light carburetted hydrogen, would, by the removal of pressure, have just the proper quantity added to it, with the result that has many a time happened—death to some, danger to many, and sorrow to all. I am sure you all see the importance of having the instrument, and noting its variations.

On the variations of a thermometer placed at the pit bottom very little depends. Of course it is very different as regards the variation of the difference of temperature in the upcast and downcast shafts; but any remarks on that subject would be apart from the purpose of this paper. A daily record of such difference would from a scientific point of view be very useful, but I have hitherto not made that record. I mention it to you as worth thinking of. A word about "remarks," and I am done.

It has been said to me, How would you look if this "record" were brought into a court of justice to show that fire had been frequently seen in your pit? To this I would say, I trust there will be no need to bring any such "record" into such a place; but what should I fear? If the record shows that day after day I am allowing fire-damp to lie anywhere within the reach of a fireman, then the book ought to bear witness against me, because my duty was to have removed it by the proper means—dilution. If the record shows that wherever fire-damp is found to-day it has been removed before to-morrow what have I to fear from the fact being known? If the record shows that wherever fire-damp is found in the morning it is removed at once surely there is no need to blush for that. Our masters, at least my masters say to me, "Provide a sufficient amount of air to make the pits safe." If the means put at my disposal are not sufficient to do that, I must have better means, or the responsibility will be theirs, and not mine. If the means are sufficient, and I use them inefficiently, or improperly, by all means let the record bear witness against me. The fact of my having kept a faithful record of the state of a pit may make it worse for me if the state of the pit can be proved, from the record itself, to have been bad, but in no other case can it injure me or hurt my masters; and that is just the very case in which the public would say, "Poor fellow! it is a pity; but he should have been more careful."

These, Mr. Chairman, are, it seems to me, good reasons for keeping a daily record of ventilation at all collieries, and I shall be very glad to hear that these hints have been thought worth your consideration.

THE MINES INSPECTION AMENDMENT ACT—No. III.

SIR,—Working men, and more especially the advocates of what they call their rights, have often been accused of demanding for them the highest possible rate of remuneration for labour, sometimes with no regard to the rights of others, while they have shown little zeal in insisting upon what is their unquestioned right—namely, that reasonable precaution shall be taken to protect them from needless danger, and to secure them and their families from destitution whenever they are injured or killed by accidents which ought to have been avoided. Without stopping to enquire how far the accusation is just, or whether it is just at all, it cannot be doubted that it is very generally believed to be so, and that public sympathy with working men, *as a class*, has thereby been greatly diminished. An opportunity now offers itself of proving that whatever indifference to the safety of workmen may have been either really or apparently felt, it is felt no longer, but that they and their friends are determined to show, that it shall not be their fault if those engaged in very dangerous work shall continue to be exposed to dangers which are well known, and might easily be avoided.

One of the measures promised for the coming session is an amendment of the Mines Inspection Act, which is asserted to have two objects—1st, to diminish the dangers which attend mining; 2nd, to secure to miners fair payment for their work, by providing for the abolition of truck and payment for coal got by weight. The danger is that the representatives of the pitmen, in their eagerness to secure the latter object, may neglect the former, which is of infinitely greater importance, and more completely within the reach of remedy by law. There is not likely to be much difficulty in inducing Parliament to enact that any precautions proved to be essential to safety shall be observed, under penalties for their proved non-observance; the real difficulty will be to render the neglect of such precautions more costly than their proper observance, for as long as it is very much cheaper to avoid adopting costly precautions than to adopt them, there will always be a constantly acting motive to avoid the cost.

This is very imperfectly counteracted by the fear of penalties, as experience has amply shown. Two remedies for this evil have been proposed—one, a very large increase in the number and power of the Government Inspectors; the other, imposing upon those who can profit by the avoidance of expense for precautions the cost for injuries caused by *accidents* which occur in consequence of such expenses not having been incurred. To the first proposal there are very serious, if not fatal, objections. Not only would it cost far more than Parliament is likely to sanction to employ so many Inspectors as would be necessary to enforce the constant observance of all the directed precautions, at the three or four thousand coal pits that are at work; but if they were appointed, and if the responsibility of the men's safety were directly thrown upon them, it would to the same extent be removed from the owners and managers of mines: and unless the Inspectors did virtually supersede the authority of the managers, which would be nearly equivalent to providing managers for mines at the cost of Government, there would be constant and dangerous conflict, or at least embarrassing division of responsibility. Something can, of course, be done by a moderate increase in the number of Inspectors, and still more by relieving them of other calls upon their time, by providing clerks and other assistants, but no one can doubt that the most effectual, as well as most just, way of ensuring the observance of precautions would be by making it the direct interest of those who ought to observe them that they shall be observed; nor can any just man deny that those who, by neglecting precautions *they are legally bound to observe*, allow others to be injured or killed, who would not be so injured if such precautions had been observed, ought to be liable for, at the very least, the money loss such injuries occasion.

It may not unreasonably be objected that no change of law is needed to make those who cause an injury liable for the loss it occasions, but those who so object are not quite aware of the wide difference between real justice and technical law. If A., by his illegal neglect, injure B., without *any* neglect on B.'s part, A. is liable in compensation; but if the injury be done in any degree however small, or if in a material degree, by the neglect of B., he can sustain no claim for compensation; the effect being that though B. be injured *chiefly* by the neglect of A., but partly by his own neglect, the whole of the money loss, as well as all the bodily pain and mental anxiety, must by the law of England be borne by the sufferer, which law is, we are sometimes told, "the perfection of human wisdom." The question is shall such law continue to disgrace our country? Can we not make our representatives in Parliament understand that it would be more in accordance with common sense and common justice, if when two persons have been in fault, from which one only has suffered, the money loss, at the least, shall be divided so that the chief part of it shall be borne by the one who is adjudged to have been chiefly in fault, either by act or by neglect? It may be expedient, and does not appear unfair, that a sufferer from an injury partly, but only partly, due to his own carelessness should not be entitled to as much compensation as if he were wholly blameless, but how anyone can persuade himself that such a sufferer is entitled to no compensation at all (as the law declares), even although his carelessness could have caused him no injury if another had not been still more culpably careless, it is impossible for common folks to understand. To take a recent decision for illustration. A short time since three men were killed in consequence of a mine rope breaking while they were in the cage, which it would have supported had it not been scorched by the accidental (careless) overheating of the shaft. By clear provision of the Act the soundness of every coal mine rope is ordered to be tested every day by a load of coal before men enter the cage. Had this evidently proper precaution, expressly directed to guard against this very danger, been observed the men would not have been killed, for the rope would have been broken by the load of coal, because it is far heavier than the men. The widows and orphans of these victims of carelessness, reduced to destitution by their death, claimed compensation, to save them from the workhouse, from the owner of the mine, who had allowed a precaution essential to safety to be neglected, but they were non-suited, because it was ruled that as the men had known that the soundness of the rope was not tested, that precaution being habitually neglected, they by their negligence in not insisting upon the due observance of the law had themselves contributed to the accident, and therefore their widows and orphans, who at least were blameless, must be left dependent upon charity, or go to the workhouse. No doubt this is very good law, but ought such law to continue is a question the people of England are likely to ask in no very patient tone, and now is the time to get such a question answered.

Some silly people urge that if those who are injured partly by their own negligence were entitled to any compensation for such an injury, it would render careless people still more careless of their own safety, but no one does or can believe that it would render himself more careless not to avoid getting his leg broken, if he thought that he might get part compensation from somebody else, whose joint carelessness might help to break it; and why should anyone suppose that a change of law that would produce no effect upon his own mind, would produce so strange an effect upon that of others? Who is there that would willingly submit to a serious injury for a chance of being paid part of the compensation he would be entitled to if he were injured by the carelessness of another solely? The plea is an idly excuse for denying self-evident justice. Who would willingly risk being killed for the chance of his wife or family getting by his death less than half as much as he earns for them?

We do not wish to ask for more than is strictly just, but let it be clearly understood we will be content with nothing less; and this much, at least, we should demand—that after any accident causing personal injury enquiry should be made by impartial mine engineers or others, as assessors, to decide if the accident would have happened had some precaution the owner is by law directed to observe not been neglected; and if it be decided that the accident has been essentially caused by his neglect (that is, would not have occurred without it) he shall be liable to pay to the sufferer, or to those who were dependent upon him if killed, such limited compensation as will save him and them from destitution. If the sufferer have been himself to blame let that be considered as a plea for reducing the compensation, but not for refusing it altogether. When such is the law, as I trust it soon will be, the Mine Inspectors will find as little difficulty as the Factory Inspectors do in inducing the owners to insist upon the due observance by those they employ of all the precautions they may be directed to observe, or cause to be observed. If any banksman in a well reguluted colliery district dared to let men enter a cage without having previously tested the soundness of the rope he would be dismissed on the spot, and would find it very difficult to get employed again in that capacity. If the laws were made to correspond with justice mines in every district would in such respect be well-managed ones. Their owners could not venture to be negligent of precautions they are specially directed to observe. So careful are many managers to enforce this and similar precautions, that they have rendered their shafts, which without such care would be so dangerous, almost as safe as common roads. I know a colliery down which about 500 men and boys descend daily, where there has not been a fatal accident in the shafts for 20 years. Of course, the carefulness with which every rope is changed long before it can break relieving the banksman from his post before he gets overtired, and thereby inattentive to signals, the constant watchfulness to guard against every risk, costs money much, but not all, of which may not be repaid in diminished losses, which would occur if the care were less; but for the greatest losses of all, the loss of life, which by such care and liberal outlay are avoided, the mine owner gets no *direct* compensation, and it is neither wise nor just that he should not. "It is worse than a crime, it is a blunder," to tempt anyone to neglect his duty, and when needy coal owners who are allowed to escape expenses they have caused by avoiding cost for precautions they ought to have observed, they are tempted to avoid such cost, and some of them yield to the temptation. If we allow such temptation to continue it will be we not they who will be chiefly to blame.

PHILO.

DESTRUCTION OF FIRE-DAMP.

SIR,—In the Supplement to last week's Journal your correspondent, "Safety," asks if it be not possible by decomposing fire-damp to avoid danger of explosion, without removing the gas by ventilation. It is not impossible to burn the gas quietly—in fact, much of it is so burnt in safety-lamps, giving very clear indications of its presence—but if all the gas in a highly explosive mixture of fire-damp and air were burnt choke-damp would be formed, and the men, though not scorched, would be suffocated.

The most explosive mixture consists of ten volumes of air (containing two of oxygen) with one of carburetted hydrogen: after explosion and cooling the product would be eight volumes of nitrogen, one of carbonic acid, with water and watery vapour. In such a mixture men would be drowned; but even supposing only about two-thirds the proportion of fire-damp (and with less the mixture would not explode), there would be found if the fire-damp were burnt 6·6 per cent. of carbonic acid, and only the same proportion of uncombined oxygen, which mixture men could breath for a very short time only. I see nothing for it but the removal of the fire-damp, so that mine air shall not be explosive, with the temporary suspension of coal getting and of powder blasting, whenever the ventilation is insufficient for such removal, until it is rendered sufficient. We must make our choice between a trifling, and to the consumer an imperceptible, increase in the cost of coal getting, for proper ventilation and while it is insufficient temporary suspension of work (as proposed by your correspondent, "Philo," last week), or bear with the continuance of disasters that are a disgrace to civilisation, to humanity, and to religion, as they might, in the great majority of cases, though not in all, be effectually prevented.

H. H. P.

THE "LONDON JOINT-STOCK BANKS."

SIR,—The London and Westminster Bank has resources at its command of 30,236,665*l.*—viz., capital and rest 3,000,000*l.*, acceptances 1,015,963*l.*; with deposits, 26,220,701*l.* The gains for the past half-year were 175,271*l.*; a sum minus 9559*l.* when compared with the previous half-year. The shares are of 100*l.* each, 20*l.* paid, and the dividends for the past year was 18 per cent. on the latter sum; the market value taken at 63*l.* 10s. per share, investors receive 5·67 per cent. on money embarked; this bank has eight branches. Comparing this institution with the Bank of England, the deposits stand at 26,220,701*l.* as against 28,931,338*l.*; the acceptances against 385,519*l.*; capital 2,000,000*l.* against 14,553,000*l.* against 3,364,529*l.* The Bank of England has the issue of notes to the extent of 15,000,000*l.*, whilst neither the Bank and Westminster or any other metropolitan joint-stock bank is allowed by law to issue any notes whatever. The Bank rate of interest is 3 per cent. The profits of the Westminster Bank for the past half-year were 1·16 per cent. on 30,236,655*l.*, the gross resources, and the gains 0·95 per cent. than for the previous half-year on the paid-up capital. The deposits were increased 3,452,438*l.* Under these circumstances cannot clearly perceive the advantages derived from the 18 per cent. for money at call. The Bank of England allows 2 per cent. on money deposited. The price of its stock is 246*l.*, or 46 per cent. premium; the last half yearly dividend was 4½ per cent., so that purchasers receive 3*l.* 13*s.* 2d. per cent. on their investment, or 5*l.* 10s. 2½d. in the London and Westminster. In regard to the London Joint-Stock Bank, there appears to exist a difficulty in ascertaining the actual position of its affairs, consequent on the continuance of the non-publication of details furnished by every other London joint-stock bank, such as the amount of deposits and current accounts are lumped with the amount of acceptances; hence, the public possess no data as regards the deposits, and the consequence is, that although the dividends for the past half-year amount to 25*l.* 5*s.* 6d. per cent. on 15*l.* paid, or 1*l.* 18*s.* 9d. per share, the market value stands at 43*l.* 10*s.*, whilst the London and Westminster shares are quoted 63*l.* 10*s.* upon dividends of 18 per cent. Investors, therefore, will secure 7*l.* 18*s.* per cent. on the investment of the London Joint-Stock Bank shares. The total amount of deposits and current accounts, with acceptances, amounts to 16,116,720*l.* The paid-up capital is 1,200,000*l.*, and the rest close on 700,000*l.* The working expenses of this bank for the past half-year were 21,849*l.* against 62,086*l.* for the London and Westminster; while the dividends of the latter exceeded the London Joint-Stock by 53,000*l.* The expenses also were greater by 21,849*l.*; and notwithstanding the dividends of the London Joint-Stock exceeded all other metropolitan banks, viz., 20·39 per cent. on the paid-up capital—yet the shares of the latter by value yield a larger percentage that any other of its competitors.

The London and County has 113 distinct establishments, with a paid-up capital of 1,000,000*l.*, and a reserve fund of 500,000*l.*, which two sums give a capital of 8850*l.*, and a reserve of 4425*l.* for each of the 113 departments. The deposits and current accounts amount to 16,116,720*l.*, equal to 142,650*l.* for each branch. The acceptances are 2,778,016*l.*, or (say) 24,600*l.* averaging the 113 departments. There can be no question that these acceptances are all represented by cash or good securities, and in the transactions of this well-managed institution they must constitute a valuable part of the assets, as the many of the branches in the country, and acceptances given there, are remitted to London. The working expenses were 107,098*l.*, leaving a dividend 95,000*l.* for the past half-year; the actual profits were 98,098*l.*, or 7997 above those of the previous six months. The dividend was 19 per cent., as against 18 per cent. on 20*l.* paid-up shares in the London and Westminster, yet the market value was 4*l.* 10*s.* per share less, and consequently investors would secure 6·27 per cent. on the capital.

The Union of London dividends for the year were 20 per cent. on 15*l.* called up, or (say) 6·66 per cent. on 45*l.*, the market value of shares. The deposits and current accounts amount to the large sum of 13,800,827*l.*, with acceptances of 4,363,859*l.* If these acceptances are drawn against cash, which alone is true banking, the deposits and current accounts must be reduced to 9,436,968*l.*, or otherwise exerted, covered by securities, no matter how select, there is an undenominable risk incurred foreign to legitimate banking, hence we cannot but prise to perceive that investors can obtain the same interest and no other money in purchasing shares in the Union as in that of the London and South-Western, wherein the deposits and current accounts are only 609,234*l.*, with outstanding acceptances of 44,399*l.*, the latter is 5000*l.*, and that of the Union 300,000*l.*

The City Bank has deposits and balances on current account of 2,780,764*l.*, and acceptances of 2,327,134*l.*, or 83¾ per cent. of banking obligations. The shares (10*l.* paid) sell at 3¾ prem., and provides (1871) of 9 per cent. yield investors 6*l.* 3*s.* 8*d.* The extent of the business carried on by this bank is beyond my comprehension. It has four establishments, and should, in my judgment, be a finance company instead of a bank. The paid-up capital is 500,000*l.*, and the uncalled capital is also 500,000*l.*, whilst the reserve fund is to be 110,000*l.* The current accounts have augmented 1,000,000*l.* during the past half-year.

The Consolidated appears to gain strength, as also the Alliance. The Metropolitan has increased its balances 87,876*l.*, and relatively deposits of 677,868*l.*, with acceptances of 118,612*l.* The capital is paid up in full (200,000*l.*), and the company is limited. The only metropolitan bank so situated. The Imperial has lost balances of 39,621*l.*, and the Central of 17,128*l.*; still, the quoted shares have advanced 3¼ in the former, and ¼ in the latter, compared with six months ago. The Metropolitan had receded since date of meeting, and 3*l.* since, which is the only one depreciated value out of the eleven banks that have held their half-yearly meetings. These eleven companies have 172 establishments, while the National Provincial of England possess 144. The half-year return of the latter has not yet been published. The aggregate deposits and acceptances of these eleven banks amount to 96,268,740*l.*, the total paid-up capital and reserve funds amount to 10,999,137*l.* In addition. Comparing the latter amount with paid-up capital alone of the Bank of England, there is a deficiency of 6,918,403*l.* between the joint-stock bank referrred to, and in favour of the "old lady of Threadneedle-street. The net profits of the eleven banks amount to 640,385*l.* for the past half-year, and the gross sum at their disposal was 107,267,867*l.*, so that the gains were under 12*s.* per cent. for the period. When the competition for business is duly considered, and the risks of finance duly weighed, joint-stock banking may be regarded at an exceedingly low standard; and one, if not more, of these upon the *tapis* will probably have to succumb so soon as a monetary crisis occurs, and possibly before

R. TREDINNICK,
Consulting Mining Engineer.

3, *Crown-court, Threadneedle-street, London, Feb.* 5.

COPPER MINING ON LAKE SUPERIOR.

SIR,—As a commencement upon the strength of a very great improvement in the Copper Market, I hear the once-celebrated Cliff Mine is about to be drained for further development in the spring. Had the mine been conducted as it should have been, in my opinions are it would not have stopped, but continued operations with a spirited force. As it was they made a large profit on the month they worked, having taken out over 100 tons mineral at 66 per cent., with 40 to 45 miners.

There is not a question but the mine is good for several pounds under sound management. To place it upon such basis, however, will require some little time after it is drained. Their present shafts for the last 4 to 5 levels, instead of being on the lode, lost it, and are being sunk in the south or footwall side—thus ordering cross-cuts necessary to discharge the stuff and water. Every level in depth adds materially to the length of the cross-cuts. Estimates by competent persons were made that it cost equally much to keep the mine free of stuff and water as it did to lift ground. Several drifts are off the main lode likewise—good branches, &c. It is thought just now if the present company have patience, and defray the expense to put these mistakes right, the mine cannot fail declaring good dividends, and to redeem standing. It is understood that the concern is gone from Phila. to Boston—it is said for the sum of $140,000. A few such as this would quickly add to the brightening up of times on Lake Superior, which is much needed, and the properties are here for action. In many instances there is plenty of machinery on hand to work with.

The Alvarez Mine, about 6 or 7 miles south of the Cliff, and 4 miles from the Calumet and Hecla north, is about to commence mining. They are now putting up one of Vivian's engines, 30-in. bore and 5-ft. stroke, to hoist with. A small lake, about from the mine, gives them a splendid opportunity for the erection of any sized stamps they may need, and which I hear is their intention to erect there. They also speak of carrying out most of their work by the Burleigh Drill, which is being successfully worked at the

Falls. We look upon the statement concerning its success which peared in the Supplement to the Journal of Nov. 4, however, as a le too flattering. The drill will do its work very rapidly. I have n it drill a 2-in. hole in the hardest of trap-rock, 2¼ ft. in 7 mi tes; and in Copper Falls no doubt it drilled all your correspon nt states, but it is a query whether he did not forget some of the penses which should have been charged. We are all too apt to eak very flatteringly of anything which may have our good feel ve. At the Calumet and Hecla Mine they tried one of the Dia nd Drills, which turn and bore like a carpenter's auger; but it ms they are a failure, having broken two or three diamonds in a rt time.

The Alvarez lode is some 30 to 35 ft. wide, and rich in stamp rk in places, which can be selected to produce 3 to 4 per cent.— ile a heavy portion of the lode is poor. Upon the whole, it is con fered a very kindly adventure. A MINER.

Houghton, Mich., Jan. 15.

REMARKS ON THE ORIGIN AND FORMATION OF METALLIFEROUS VEINS.

SIR,—In my last I summarily dismissed the notion that metalli rous deposits were formed, as now existing, during the seven days creation, whether considered as natural days or the great epochs geology. The igneous, or Plutonic, theory—for so it may be ap opriately called—which so widely obtained, and can scarcely yet said to be numbered with the things of the past, has some little nsibility—superficially looked at—in its favour, because associ ated with the active principles and agencies of matter. This theory pposed—or supposes, for it cannot yet be said to be extinct—that some period of the remote and dim past chasms were formed of e exact dimensions now found to constitute our metalliferous veins rome volcanic action, and extending downwards to the very bowels the earth. That through the fissures thus formed aqueous and eous vapours ascended, containing acids, sulphur, silica, &c., and so metals in a highly sublimated or volatile condition; that the ndensation of these led to incrustations of the sides of the fissures ntil the whole was filled from side to side, that then chemical action mmenced, and continued through the course of untold ages, until e formation of the lodes as we now find them was complete. It is mewhat remarkable that it never seems to have occurred to the dvocates of this theory that laws which must have been in opera on then are in abeyance now, as no evidence anywhere exists of ch effects being produced in the present day. And it is to be pre amed with a great degree of probability that the fundamental laws f Nature have not changed from that time to the present.

Nothing is more difficult as a tenet of the human understanding han that which is irreconcilable with the dictates of common sense, nd this theory will be found to be precisely of that class. If it were ecessary to adduce evidence in favour of this assertion we need only onsider the mechanical effects which our own reason would suggest o us as inseparable from such an agency. The formation of a fis ure on the surface of the earth by the bulging out of the crust hereof from internal pressure must always suggest itself as occur ring where the strain was greatest—and where could that more effec ually take place than in a line vertical to the centre of the force exerted, which would be on the ridge of the mountains? The veins denominated "true fissure veins" must, then, of all others occupy hat position, like some of the igneous rocks—basalt, trachytes, &c.; and no other can be assigned to them in keeping with this theory, unless it be urged in rebutal of this view that mountains which were once projected by upheaval may again retire by subsidence, but such an interpolation (if tenable) would only increase the difficulty by multiplying strongly uncompromising facts opposed to the object they were intended to support—as it would then follow that, instead of one, two equally improbable positions would be assigned as the sole localities wherein true fissure veins could be found, viz.—on the top of the mountains and in the centre of the valleys, both longitudi nally. But this, as the sequel will show, is not the case, and, accord ing to our idea of things, never can be.

It may be further urged as a dictate of reason in opposition to this theory that chasms formed by expansion or undue tension of the rocks from the action of forces exerted from within, and then being subsequently filled with material consolidating into rock, equally hard and resisting as the rocks themselves, the idea of an arch, from a subterranean point of view, forcibly suggests itself to the mind as the natural interior form of all such occurrences, and of which the lode may be said to be the keystone, and until that support shall undergo dissolution, or the great globe itself be dissolved, no conceivable idea can be entertained of its ever giving way; and when either of these events shall take place it will require no supernaturally gifted genius to determine that the respective lodes will not only lose their identity, but entirely cease as such to exist, and, therefore, the same lode can never occupy the top of a mountain and the centre of a valley alternately.

At what precise depth Pluto's operations are carried on it is somewhat difficult to conjecture with any degree of confidence, since geologists so widely differ in their estimates of the thickness of the earth's crust. Mr. Hopkins, who sometime since was President of the Geological Society of London, is said to have determined by a series of profound mathematical calculations on the mutations of the earth's axis and on the precession of the equinoxes its thickness to be 800 miles, whilst other geologists, from various experiments made by them, conclude it to be no more than from 200 to 400 miles. Wide as is the difference between these conclusions, an equally wide difference appears when they are compared with others arrived at from calculations founded on ascertained facts regarding the earth's temperature. The heat in mines has always been found to increase with depth, and this has led to a variety of experiments on the subject, an average of which gives about 1° Fahr. for every 40 ft. in depth, According to this no known solid matter could extend more than 30 miles below the surface, unless recent pyrometrical experiments for ascertaining the melting point of the most refractory substances with which we are acquainted are althogether in error. That error exists on this head no one can doubt, since such a diversity of results is found. If we take that of the melting point of iron, for example, one gives it at 21,000°, another at 17,000°, and another at 3479°; and Prof. Daniel, by recent experiments with his improved pyrometer, gives it at 2786°. It is needless to say that there is a surprisingly wide difference between these results, but whichever may be taken and applied to the theory in question will be found equally fatal to it. If Wedgwood's temperature of 21,000° be taken as the melting point of iron, the thickness of the earth's crust (159 miles), though palpably insufficient as a shell or band for the preservation of the globe, would be far too thick to admit of chasms being formed on its surface of any moderate dimensions, since the size of chasms formed by such agency must always be, from the unelastic nature of the rocks, proportional to the altitude of the mountains in which they are situate, and the thickness of the earth's crust at the point fissured. If we take as the most definite the altitude of the mountains as the basis of our calculation for the purpose of illustration, we shall find that chasms opened at the earth's surface by this agency cannot be less in width than the length of the versed sine of the arc formed by the curvature of the mountain from base to base—that is to say, in a mountain of only 1000 ft. high the chasm formed on its top should be 1000 ft. in width, and in the same proportion for every other greater or less elevation; and, as the general contour of all such chasms must, wedge like, regularly incline to a point of termination in depth, and as that point is assumed to be determinable only with the thickness of the earth's crust and the structure of metalliferous fissures not conforming to this condition, it is only fair to presume that their origin must be sought for in another direction.

Discussing the question from this point of view may look very much to many of your readers in England like setting up a man of straw to knock him down again, but it can only appear so to those who do not know how rife theories are respecting this subject in other countries. Like many other important subjects regarding which fanciful theories are entertained, independently of any basis resting on the testimony of facts, conclusions are arrived at and entertained with as much confidence and assurance as if they had been deductions from self-evident propositions. The doctrine of the internal fluidity of the globe is still held by many to be true, and that the molten interior mass is largely metallic. They derive their evidence for this supposition on the increase of temperature from the surface downwards, and on the mean density of the earth, which is considerably more than that of the rocks found at the surface. They, therefore, conclude that the interior must be largely metallic to compensate for the deficiency in weight of the exterior or superficial rocks. This view seems to take no cognisance of the increase of density of the same material in depth, due to gravitation, which always acts with a force increasing in proportion as the square of the distance from its centre is lessened. Lyle says—"Water subject to this law if it continued to decrease in volume according to the rate of compressibility deduced from experiment would have its density doubled at the depth of 93 miles, and be as heavy as mercury at the depth of 362 miles." ROBERT KNAPP.

Ellsworth, Nye County, Nevada, Jan. 3.

PARALLELISM OF PRODUCTIVENESS IN LODES.

SIR,—Upwards of half a century back what may be called Parallelism of Productiveness in Lodes was observed by the clever author of the "Statistical History of North and South Wales." He does not attempt to explain it, though he gives a good account of the mines and minerals of Cardiganshire, merely mentioning it as a curious fact. Anyone looking at the Ordnance Survey cannot fail being struck with the correctness of this view, for there he will see that the chief mines are situate about due north and south of each other, and any geologist will tell him that the grain of the country is in the same direction. From this it may be inferred that certain strata are more congenial than others to the formation of ores, the metallic matter being, perhaps, held in solution in the lodes until deposited in a crystalline shape, when these lodes pass through, and thereby become influenced by, such strata. There are cross-courses or flookans also running in the same direction, which appear to have much to do with good mines. These have been formed subsequently to the lodes, for they dislocate them as they pass through, and as they thus dam up the impregnated water which otherwise would flow continuously in the lodes, generally cause a rich body of ore to be formed right up against them on one if not on both sides—indeed, the rule is that that which the broken lodes contain on the one is usually found on the other also.

Such a cross-course or flookan of unknown width, for no attempt has been made to drive through it, passes at the eastern end of the workings in the West Florida Mine, and on it quite up to the surface a body of ore was found in the east and west lode, yielding at least 3 tons to the fathom, and, taking this as a starting-point, some light on parallelism, &c., may be got by following the track of this great cross-course. It will be found to go through or close by the richest mines of the county, viz.—Penwemhir (anciently called Fairchance), Llwynllwyd and Llwyngwiddil, Esgairmwyn, Glogfawr, Glogfach, Logylas, Ystumtein and Bwlchgwyn, Powell United and its adjacent bundle of mines, and still further, in exactly the same northerly direction, the great Old Henfwlch, and the greater and more famous Esgair-hir or, as, more commonly called, the Welsh Potosi. Accompaning this cross-course is a channel of clay-slate, which, judging from its effect on these different lodes is of a singularly productive character, as evidenced by the Geological Survey, Nos. LVII., N.E. Tregaron, and LIX., S.E. Machynlleth.

If any certain knowledge shall ever be obtained on this interesting matter it is clear that mining adventures will no longer be hazardous, and sometimes ruinous, speculations; and these few and imperfect remarks it is hoped may awaken the attention of the observant and experienced more particularly to the subject.

HUALPA.

THE TIN, COPPER, AND LEAD OF THE FUTURE.

SIR,—In my last I called your attention to our coal and iron supplies, and the reasons we had for gratulation that neither the coal and iron of the United Kingdom, nor the coal and iron of the world at large, were about to fail, and that all croaking on the subject of which so much has been heard of late is "frivolous and vexatious." Since then tidings have arrived of an immense discovery of coal in the territory of the Nyzam, not far from the British dominions proper. The area is said to be so extensive as to be adequate for the supply of coal for all India, British and otherwise, for the remainder of this century, however progressive its commerce should be, and however the locomotive, the steam-engine, and the steam-ship might require to be fed with this fuel.

Advices from India also assure us of the presence of vast masses of ironstone having been examined in the Himalayas. Wherever iron and coal are found that nation is sure to go ahead itself if well governed, and to scatter advantages upon others, so that the prospects of India are brightening, and, by consequence, our own.

In my last I called your attention to the fact that out of Cornwall and the Malacca Straits there have been no discoveries of tin worth notice, and that, however the workings and production may be increased in these directions, tin must rise from sheer scarcity to a value unprecedented, and happy is he whose share-case, if not his quiver, is full of proofs and titles of tin mining investments. Hitherto the tin mines of Cornwall have yielded immense profits, and it is known that the Batavian operators in the Great Eastern Archipelago have made vast fortunes by the metal, but these are as nothing to what will be made.

Allowing the past to exemplify our remarks, when we have proceeded to examine the conditions and prospects of the other superior metals, your readers will not be desirous of disputing the superiority of mining in Cornwall to all other descriptions of investment whatever. Copper has risen since the end of 1870 more than any other metal. Lead advanced quietly, moderately, and soundly. Iron ran up 30 per cent, and is still rising, checked only by the untoward misunderstanding of the Treaty of Washington between the contracting parties to the treaty preliminary to the arbitrations, a misunderstanding which it is computed has cost Great Britain already 5,000,000*l.* by depreciation of prices and retarding of business. Tin rose in value within the same period, according to Government data, precisely in the same degree as iron. But copper advanced nearly half as much more as either of them—near 50 per cent.

Of all these metals taking a longer period—say three years—into account, tin has most advanced. It has more than doubled in price within a few years. Depressed to the, with astonishing celerity, realizing the adage that "When the worst comes to the worst things will mend." Indeed, copper is also an illustration of this, or a similar one, "The densest darkness precedes the dawn," teaching all investors and speculative miners that they may take for their motto, *nil desperandum*. Copper was never so low as some year and half ago, and was not often so high as it is now, and there is every prospect of its going up still.

At the same time it is right to say that this metal is more likely to recede than tin, because it is found in every region of the earth, or, as an Irishman would say, in the *five quarters* of the world—namely, Europe, Africa, Asia, Australia, and America. It is plentiful in the British Isles, especially Cornwall and Ireland. It is found in various continental countries, especially the ancient Iberia. In North Africa there are good fields of cupriferous ore. In America it abounds everywhere, from the shores of Lake Erie to the southern extremity of America, becoming more prolific westward and southward, until the grand copper regions of Chili and Peru are reached.

It is plain, then, that with present high prices more produce will be brought to market, and from recent intelligence we gather that the work of exploration is going on in Queensland and the older countries of Australia with prospects of success. Lead is on the incliuation upwards—slow, but sure. There is plenty more to be had. Cornwall and Shropshire, in England, are rich in this metal, and lately a valuable mine was discovered at Keswick, in Cumberland, which has been pronounced by geologists, mineralogists, and practical miners as exceedingly rich. South Wales is pregnant with lead, especially in the counties bounding Shropshire. The great Van discovery testifies this, and has awakened attention to lead mining in Wales, which ought to have been wide awake long before. Cardiganshire is tolerably replete with silver-lead of excellent quality.

The light-footed Irish trip about over mines full of this heavy and valuable metal. Some are worked, but they are nothing compared with the treasures of this metal beneath the green sod of the "Emerald Isle." Lead, so far as we know, does not appear to be so generally diffused as copper. In Spain and Portugal there are valuable mines, but the metal has not been so generally sought after as it will be abroad. In Portugal we have lately had a remarkable exemplification of the latest resources of lead there, and there can be no doubt that Spain will afford similar illustrations of the pregnant womb of the Peninsula with this as well as other metals. I refer to the Chans Silver-Lead Mine one of the best discoveries we have recently heard of in this department of mining, so the geologists and mineralogists who have inspected it declare that it is a proof of the richness of Lusitanian Mines. It is fortunately so situated that its products can be easily transported to Britain, the great metal mart of the world.

It will, as a finale on this subject, be important hereafter to give a more comprehensive list than yet published of the mines of the superior metals which afford the best dividends to the proprietors.

Gresham House, Feb. 7. THOMAS SPARGO.

THE MINERS' WAGES QUESTION.

SIR,—As observed by your correspondent, "A Mine Manager," it is quite as easy for a mine agent to cause a rise or fall of wages under the four-weeks month as the five, and the idea that the tutworkman and tributer will in the long run be gainers by the adoption of the new scheme is an utter fallacy. They will in reality be worse off than before, as it is well known that there were certain advantages connected with the odd week; the tributer, for example, always preferring a five-weeks take to a four.

It will probably have occurred to most of the readers of the *Mining Journal* as somewhat remarkable that the landlords, clergymen, land agents, and others of less renown in the county of Cornwall, should all at once in a time of prosperity have sprung into the arena as the miners' friend, whilst during a period of depression, unequalled in modern days, no voice was raised to ease the terms of mining grants, or any other acts of liberality exhibited whereby the working of mines might be continued, and the miner, and all engaged with him, as a natural consequence, be benefited by the change. It will, doubtless, also appear just as strange, after all that has been said and written concerning the "poor, oppressed miner," that whilst all other classes of labourers are striving to have their hours of work reduced, he is in a position to work an extra fortnight in the year, and then have more holidays than any other labouring class in the community. The recent agitation, in plain truth, was raised by parties totally unconnected with mining, who succeeded in obtaining sympathy for the miner under false pretences.

The rise in the price of metals, including tin and copper, necessarily brought prosperity again into the county, and the miner was already sharing fairly in that prosperity, and would have been content to rely on the consideration or his employers but for the idiosyncrasies of certain popularity-seeking individuals, generated in every large community, who sought to make capital (political in some degree it may be, now that nearly every man is a free and enlightened elector) out of the miner, and who have succeeded in annihilating the almanack, and in upsetting a system which has worked well for generations, the new scheme substituted being justly held in derision by every impartial man of business in the country.

Feb. 7. VIATOR.

"WHAT TO SELECT—WHAT TO AVOID"—No. XI.

SIR,—Among the many misconceptions of the mining public none would appear to be so general as the determining the merits of a property by the marketable price of the shares. I pointed out last week that exceptional causes were productive of exceptional values—supply and demand being more potent in their operation than an improvement or a falling off in the actual worth or prospects of a mine. The inexperienced can neither fully realise nor duly estimate the applied value of the knowledge that enables one to ascertain whether any particular share has been advanced beyond or forced below its real worth. Hudibras says that "a thing is worth what it will fetch," which is perfectly true as referring to a mine share; and it is by taking advantage of market effects (which can only be done by sound, practical, and experienced advice) that large, and often enormous, profits are made, either by realising when the market has been brought up to a high but an unstable tension, or securing an interest when quotations have been depressed by extraneous causes, or it may be by a temporary decline in the material value of the property.

Variability is inseparable from every mine, indeed a practical miner, for many reasons which I need not here enumerate, always prefers a lode that continually fluctuates to one that maintains a uniform value—experience has taught that it is more permanent and productive. These ever-recurring changes are the investors' and speculators' opportunities, it being almost invariably the case that consonantly therewith prices advance and decline out of all proportion justified by the condition of the mine. A dividend-paying mine has, or should have, a money representative in the amount of ore actually discovered—"reserves"—assuring to its shares a certain intrinsic commercial value; but it is mostly in progressive mining properties—not yet brought into a profit-yielding condition—that the greatest fluctuations in price take place, and the large t amount of profit is made, by securing an interest when prices are low and realising upon the advance. Few can say that they never had the opportunity of making money upon their shares (supposing the selection has been judiciously made); fewer still, however, seem to possess a sufficient amount of moral courage to sell when a profit can be secured.

In this one simple fact is embodied the whole secret of success. A speculator in sugar, corn, or any other commodity or product, is perfectly satisfied by securing a certain and often a very moderate interest upon the capital invested; but the speculator in mines seems to expect some undefined and unbounded pecuniary result from every mine in which he may happen to be interested, and often allows profits, and large profits, too, to slip by; whereas, if the same principle that he adopts in his ordinary business avocations were applied, being satisfied with ordinary profits, few, very few, would regret that they had employed capital in mines. The pursuit is not so completely a lottery as many think; it needs only the application of the same sound principle which is every day brought to bear upon all branches of our commercial industry to ensure much more satisfactory results than can possibly accrue from any other source of investment.

A propos of that which I stated last week in referring to the White Pine district, I have received among my numerous correspondence the following remarks from a practical authority, which so fully confirm the opinion I have put forward that, with your permission, Sir, I will extract them. They are as follows:—"I have been mining in California for years, and I entirely agree in what you say of Eberhardt in Saturday's *Mining Journal*. It is all very well for people here to talk about *pockets* of ore in the White Pine district, but they must not overlook the fact that that district sent away in 1871 quantities of silver amounting to 500,000*l.*; and I am not afraid that if the mine is properly prospected some rich discovery will be made in depth. In my experience in gold mining I was always *sure* of finding the 'stuff' in depth if I found signs of it at surface."

WEST TANKERVILLE.—It is satisfactory to find that this mine, to which I directed especial attention at the end of last year, is proving equal to all that I have said about it. In corroboration of this, I cannot do better than refer my readers to the exceedingly encouraging reports from the manager which are now appearing in the Journal.

EMMA.—Notwithstanding the announcement of the payment of the third monthly dividend, and the approximate statement of accounts, showing a balance in hand sufficient to pay four more dividends of like amount, the shares are gradually declining in value. Complaints are very general that no report from the mine has been published since the formation of the company, which tends to increase the uncertainty so freely expressed in regard to the future of the enterprise. Shareholders have a right to demand from the directors information upon the vital point as to whether or not the mine maintains its productiveness in depth, or whether, as is the case in other mines in Utah, the ore has not undergone a complete chemical change, the larger proportion now being known as "refractory," which means ore most difficult of treatment. This opinion has gained considerable ground from the fact that one of the directors,

Mr. Brydges Willyams, M.P., has, at the earnest solicitation of his colleagues, proceeded to the mine to make arrangements *with regard to the smelting*. FREDK. WM. MANSELL.

1, *Pinner's-court, Old Broad-street, Feb. 7.*

THE MINERAL RESOURCES OF THE CURRAINE ESTATE.

SIR,—Doubtless there are many readers of your valuable Journal who will remember the various letters which have recently appeared therein relative to the alleged valuable discovery of iron ore on the above estate. I am informed that one of the gentlemen (Mr. Edmund Spargo, of Anglesea) has since visited the property, but I fear his report falls too much into the views taken by "Verax," or most probably ere this we should have heard more about it. I am assured that Mr. Spargo holds out great hopes of making a valuable discovery of various kinds of minerals upon this extensive property, but how far such expectations will justify one in believing the alleged wonderful discoveries of rich hematite ore no one but those privileged to pry into the said report can possibly enlighten your readers. Your kind insertion of these remarks may possibly draw forth such information as we require to avail ourselves of. FERRO.

Hoxton, Feb. 9.

THE GRIT MINES, SHELVE, SALOP.

SIR,—So many enquiries have been made respecting this once celebrated sett, that I should be obliged to you to allow the following facts to appear in the *Mining Journal*. The Grit Mine was let by the late Mr. More, with the Ladywell sett, to the present Ladywell Company, who have worked the Ladywell alone, and have consequently forfeited their lease, which bound them to work both setts or to surrender both, and the present owner of the property has been careful not to condone this forfeiture. The late Mr. More, before the present development of the Shropshire district, determined to let both setts together, because Messrs. Taylor and Co., who formed a company to work both setts, proposed afterwards to take Ladywell alone, and the late Mr. More considered letting both setts together the natural mode of backing his opinion of the equal or greater capabilities of the Grit sett compared with Ladywell or the Roman Gravels, the Grit Mines having at this time produced a greater quantity of ore than the Ladywell and the Roman Gravels Mines together. Ladywell is south of Roman Gravels, and the Grit south of Ladywell. Mr. Jasper More, the present owner, was in favour of letting Ladywell alone to Messrs. Taylor, when his father let both setts together to the present Ladywell Company. Before Mr. Taylor's short possession of the sett, the Grit was in the hands of Mr. Dicken, from whom Mr. Taylor purchased the three last years of his lease, Mr. Dicken having succeeded to the mine from his father in-law, Mr. Ward, who worked it alone, and to whom the Grit Mines proved a most lucrative investment. Before Mr. Ward this Grit Mine was worked by a local company, who, with more vigour than judgment, drove the Leigh level four miles from the sett; and before them it was held by Mr. Lawrence. This short statement traces the history of the mine back for between 40 and 50 years, when I find by the books of the period the amount of ore raised was nearly 1800 tons in one year.

The amount of ore raised from the Squilver, the Great Rider vein, and the South veins, as well as the minor known veins on this sett, are matters of local history, and were recorded in the Journal in 1865, by my late father, whose other reports are preserved for the guidance of future workings. Sir R. Murchison, in his late visit, shortly before his last illness, to Shelve Hill, of which the Grit sett is the southern part, especially lamented that this sett, containing so many veins, as well as so much maiden ground, was now unworked. The reason was understood—viz., because the present owner was reluctant to enforce the consequence of the forfeiture of their lease on the Ladywell Company, who, as I have stated, hold the Grit and Ladywell together, on condition of working both, and have worked the Ladywell alone.

Mr. North, of Liverpool, the Ladywell Company's solicitor, having assured Mr. Jasper More that he had no intention of bringing into the market the present company's interest in Ladywell, but that he regarded Ladywell as a permanent investment for his and his company's capital, did (shortly after Mr. Jasper More succeeded his father), nevertheless, express a wish to have the Grit and Ladywell setts divided, to which Mr. Jasper More agreed on the condition of a satisfactory company being formed to take the Grit. No such company has as yet been supplied by the Ladywell Company, and it, therefore, rests with Mr. More to enforce the forfeiture of the Grit and Ladywell lease, or to let things remain in *statu quo*, or to receive the offer of any business-like company to work the Grit Mines, as he thinks best. The proposed South Salop Railway runs through this sett, probably with a station upon it. Part of the machinery used by Messrs. Taylor remains on the mine in good condition for future use.

I have all details with respect to the past and probable future expense of working these mines, estimates having been prepared by professional authorities, together with reports of the condition of the past and of the policy to be pursued with respect to the future working of the several veins. My present object, however, in writing is to let it be known that at present no engagement has been entered into with any party except the Ladywell Company for the working of the Grit Mines.

I may add, with respect to other enquiries, that the Rhadley sett is at present the only other mining sett on the Linley estate that is at present unlet, unless the forfeiture of the Grit Hill sett, adjoining the Grit Mines on the south-west side, is insisted upon, which, like the Grit, was leased with another sett, and has equally with the Grit been unworked, apparently because in each case more land has been leased than could conveniently be worked by one company.

ARTHUR WHITTALL, Mine Agent.

Linley and Bishop's Castle, Shropshire, Feb. 7.

A SINGULAR MINE.

SIR,—Penstruthal Mine, in Gwennap, is singular, from the fact that in two months it yielded a profit of more than 17,500*l.*, for at a two months' account in 1827 that sum was divided between the adventures. No other mine in Cornwall ever gave such a dividend. The profits did not last so long as in many mines, the ore having failed before a great depth was attained. The company worked on one lode only, and that was a copper one. The last company, which ceased about 12 or 15 years ago, pursued the lode a little deeper, and reached a mass of muudic, which discouraged them, and they gave up pursuit, abandoning the mine. The present company have not only resolved to cut through the muudic, beneath which they expect to find rich deposits of tin, but to operate on several other lodes, of which there are about 20 in the sett, nearly all of them worked on the "backs" by the ancients, who left large excavations as records of their labours. On one lode, called Think Highburrow lode, they are now working—keeping the water off by a small engine—and raising tin, of which 20*l.* worth was recently sold. Abundance of that mineral is expected from that and the other lodes. They intend to erect a powerful stamping engine on the sett, and not depend on water-power for the reduction of their ore. For the number and length of the lodes the mine is also singular; where can another mine be found with so many? Several of them have a length of more than a mile within the sett. Here is a large field for operation, enough to occupy explorers for a century at least. The position of the sett is eligible, having Wheal Buller and Wheal Bassett at the west, and Tresavean at the east, all rich mines, and on the junction of the granite and killas similar, to those mines. I congratulate the company on their possession of a property that presents such indications of prosperity. Gwennap parish is likely to see good days again. R. SYMONS.

Truro, Feb. 8.

THE KESWICK UNITED SILVER-LEAD MINES.

SIR,—Having seen in last Saturday's Journal the prospectus of the above mining company, I will thank you to grant me a small space in your next impression to offer a few remarks thereon. I am well acquainted with the district in which the mines are situated, and I am bound to say it contains some lodes of great promise, but is the selection the best that could have been made by the Keswick United Silver-Lead Mines? I observe the mines are to be superintended by Captain W. Francis: I presume this is the same gentleman who has been the means of bringing the Caldbeck Fells, the Red Gill, the Haye Gill, and other mines to their present position, and if so this should be an inducement to capitalists to invest, seeing what his management has done for the mines I have mentioned. The prospectus states that when the mines were formerly worked the machinery was inadequate to the requirements of the mines. Now, if I am rightly informed, on one of the mines—the Thornthwaite—there was a water-wheel 40 ft. diameter, and three times the power required. I would also like to ask what company of smelters purchased Brandley ore at 23*l.* per ton, and what are the names of the mines in the immediate neighbourhood, and wrought on the same lodes, from which such profits have been made as to appear fabulous? I believe Cumberland mines are equal to any of our mining districts if properly selected, but, on the other hand, there are numerous lodes which have been proved to be worthless, and I should be glad if some competent correspondent would give us some reliable information on the subject. CUMBRIAN.

Feb. 6.

BWLCH CONSOLS, AND ITS MANAGEMENT.

SIR,—A few years since there was a great flourish of trumpets through hill and dale, in town and country, of the wonderful proceedings at this once condemned mine, but through the great exertions of the intelligent captain, or captains, she threw off her cloak of oblivion, and appeared in her peacock plume and strutted into the dividend parlour, where she met the directors with such a balance in her favour that induced them to say she was worth, on the whole, 8*s.* a share. Since those halcyon days, however, she has condescended once more to appear in her original true colours, and has with her numerous captains descended into the non dividend list, having fallen in public estimation as low as 1⅛ to 1¼ per share. And although according to the report issued July 28, 1871, the mine was then equal to 3 tons 9 cwts. a fathom, on the strong recommendation of Mr. Wynne, a Government Inspector of collieries, who said that if a call of 2*s.* 6*d.* a share was made it "would place the concern in a wholesome position;" and by the last report, the different levels were equal to 5¼ tons per fathom; but such is the want of confidence of the directors in the mine that they have actually made a further call of 5*s.* a share. I am now, after due consideration, induced to ask for what purpose will the proceeds of this call be, *bona fide* appropriated—to the underground workings, or thrown away in useless and unnecessary expenses for the purpose of keeping up a grand show and a great name for liberality at our expense?

I will put this point to the test by drawing a comparison between this mine and another well-known mine. By the annual report of the Bwlch Consols for the year ending June 30, 1871, the sale of ore amounted to 3769*l.* 14*s.* 6*d.*, while the agencies amounted to no less than 786*l.* 17*s.* 4*d.* I will now compare this with the Great Laxey Mine: they sold in the year ending August 4th, 1871, 32,772*l.* 6*s.* 3*d.*, while the cost of agencies, amounted to no less than 579*l.* 6*s.* 10*d.*—what a contrast! Shareholders will you open your eyes, and ask how is this? You may not have been aware of this before, but now you see that the agencies alone will take just 3*s.* out of the 5*s.* call, leaving only 2*s.* to work the mine.

Pwllheli, Feb. 2. A SHAREHOLDER.

THE NEW LLANGYNOG LEAD MINING COMPANY, AND WEST LLANGYNOG MINES.

SIR,—I find, from the Journal of June 27, that "A. B. C." has stated there are four farms lying between the above mines. He should have said three, as the Pengwern land is worked by the New Llangynog Mining Company, where they have a good lode in the 90 yard level, and also in the 110. They have also erected a new steam-engine on this property, and the distance from this boundary to the West Llangynog boundary is 442 fathoms. As this lode goes through West Llangynog Mine, I see no reason why it should not prove as productive as it now is at the Pengwern, and has been at the Old Llangynog Mine.

Having been the manager of the Old Llangynog and Pengwern Mines for the last nineteen years, I thought it my duty to set the public right, or to inform them of the truth.—*Feb. 6.* JOSEPH KNOTWELL.

EXCELSIOR TIN MINE.

SIR,—From a perusal of the five-months balance-sheet, issued last January, I find that the cost for secretary, offices, captain, travelling expenses, &c., is fully one-third of the cost total. This should not be; not that these items of cost are too much, on the contrary I consider them to be very reasonable; but the labour-staff should be increased threefold. This would not only reduce the percentage of cost of management, but if the mine will prove valuable on development—and in the opinion of many shrewed men, not in the habit of throwing their money away, such will be the case—a profitable property would have been opened out in one-third the time, and there would also be a great saving of interest on money already spent, and to be spent. It certainly requires no logic to prove that the earlier the development the greater the gain to—

A SHAREHOLDER.

GREAT ROYALTON MINE.

SIR,—In last week's Journal it is stated that the Great Royalton is to be wound-up in the Stannaries Court. I beg to say that this is not case. Mr. Grose did file a petition, it is true; but it was considered vexatious and unnecessary, as he was secured in his first steps without filing a petition. In the Great Royalton Company there a great many shareholders that could pay Mr. Grose his bill fifty times over without feeling it; and it is generally thought that Mr. Grose has been advised to do what he has doneby an unprincipled and ill-disposed party not far from the mine. Great Royalton will be carried on in spite of all its enemies. The prospects of the mine are very good. A few men in a fortnight raised over 100*l.* worth of tin in December last. A few more stamps-heads, and the mine will be a dividend one. The lodes are large and productive.

Feb. 8. THOS. PARKYN, Manager.

LLANARMON MINE.

SIR,—In the Journal of Jan. 6 a correspondent, "A. B.," asked for information respecting Llanarmon Mine, and the following week, amongst your Mining Notabilia, there was given a cheering and satisfactory report. How far that report is correct I am not able to judge, but it certainly contained a serious error when stating that West Culvert-in was the adjoining mine. I am not wishful to find fault with this blunder, but to ask how it is, considering the state of the mine to be so satisfactory, we cannot have more frequent reports upon the progress of operations, the same as are to be found in the Journal from other mines? My object is not to injure the property by bringing it before the public, but rather to obtain, if possible, what the shareholders are entitled to—periodical reports upon the progress made. I believe the property to be a good one, and with brisk management might probably be speedily improved, but this continuous silence must tend to injury, because a supposition will be founded upon it that the prospects are not sufficiently satisfactory to be published.

About a fortnight ago I wrote to the secretaries, urging upon them the desirability of publishing periodical reports, but up to the present I am sorry there has been no response. In a circular issued last month by these gentlemen it is stated that "the country for miles around (the mine) are preparing for a great rejoicing," I suppose upon the expected discovery of rich deposits of ore. If a statement like this is worth anything at all it is surely worth publishing in your widely-circulated Journal. I should be glad if the shareholders would take this matter up so that we may not be kept so entirely in the dark about the prospects of the mine.—*Bradford, Feb. 7.* LLANARMON SHAREHOLDER.

TRELEIGH WOOD MINE.

SIR,—"Inquirer" is evidently not a shareholder in this mine, or he would not accuse Capt. Odgers of withholding important information, through which many parties have sold their shares who would otherwise not have parted with them. Ever since Dec. 14 last (*vide* reports in the Journals of Dec. 16 and 30) Capt. Odgers has reported to the adventurers the discovery in the 16 fm. level, but many persons have expressed their disbelief of the reports, and have persuaded some of the adventurers to sell their shares at very low prices. I suspect "Inquirer" to be one of these *disinterested* advisers, and now that the shares have more than doubled in value, and are likely to reach a very high figure, to screen himself from the result of his own ignorance and folly he assails Capt. Odgers with an insinuation which is wholly unfounded. The majority of adventurers in the mine have the fullest confidence in Capt. Odgers's reports, and are too well aware of the value of the property they possess to be frightened out of their shares by "Inquirer," or any other person who may offer his advice or opinion upon the mine. JOHN WATSON.

13, *George yard, Lombard-street, E.C., Feb. 7.*

TRELEIGH WOOD MINE.

SIR,—Your correspondent, "Inquirer," wishes to know why the discovery of thousands of tons of tinstuff left by the former workers in the 16 fm. level was not communicated to the adventurers before the general meeting. If "Inquirer" will refer to the Journal of Dec. 16 last he will see that I reported the discovery on the 14th of that month, but it was not until shortly before the general meeting that I was able to give any idea of the value of the lode from samples taken from various parts. I have nothing to do with the share market. My duty is simply to give an honest report of the mine, and the adventurers will find that I have not exaggerated the prospects. As I have frequently stated in my reports, I believe Treleigh Wood will make a great mine. G. R. ODGERS.

Camborne, Feb. 5.

VAN CONSOLS MINING COMPANY.

SIR,—I noticed in last week's Journal the following statement signed by Mr. A. Cooke: "Van Consols have risen about 10*s.* per share during the week; rumours are rife that the lode in the winze has entirely cut out, and that sinking has been suspended, and driving of the end resumed, where the lode is poor. Would it not be better to grant facilities for independent agents to inspect than to throw obstacles in the way?" Several very large shareholders having drawn my attention to this, I am obliged to give Mr. Cooke's statement a most unqualified negative. It is as untrue as it is ridiculous that the lode has been cut out.

If Mr. Cooke does not understand mining better than to make so absurd a blunder he should learn a little before rushing into print. A reference to your remarks of the same date, and the agent's report, will demonstrate the untruthfulness of Mr. Cooke's words. As to the matter of independent inspections, the second Wednesday in the month is the day appointed by the directors, who will only be too happy to afford any shareholder the opportunity of inspecting the mine. It would be well if, before setting himself up as an authority on mining matters, Mr. Cooke would at least give the subject some attention. I certainly fail to understand how a person who can have had no experience—a youth, I believe, not 21 years of age—can think of making statements in the pages of the Journal that are in direct opposition to the facts and the reports of Capt. Jas. Roach, a miner of many years standing, and one who has the entire confidence of the directors of this company, and I believe of the mining world generally. I trust you will insert this letter on the 10th.

14, *Pinner's Hall, London, Feb. 9.* MATTHEW GREENE.

VAN CONSOLS.

SIR,—In Mr. A. E. Cooke's advertisement, in last week's Journal, he says—"Rumours are rife that the lode in the winze is entirely cut out," and asks "Would it not be better to grant facilities for independent agents to inspect than to throw obstacles in the way?" Before sending his advertisement to you Mr. Cooke could have seen at the office of the company, as I did, the agent's report, which appears in the same number of the Journal, wherein he distinctly states the ore continues in the winze. Surely a positive statement like the latter is far more worth than "rumours." But from whence do these "rumours" come if, as Mr. Cooke implies, no one is allowed to inspect the mine? It appears to me the object Mr. Cooke had was to depress the shares in the market; he is, however, but a very young man, and cannot have much experience in mining, or even in market operations. I should, therefore, recommend the shareholders to put more faith in Captain Roach's positive statements than in Mr. Cooke's "rumours," and to hold their shares.—*Feb. 9.* A SHAREHOLDER.

TERRAS TIN MINE.

SIR,—Mr. Marlborough seems to think he has all the talent and wisdom of the world, but Scotchmen do not quite believe all he says. From mere curiosity I wrote to two brokers in London, who my friend said would tell me about my worthy craft, and their answers are as follows:—"I wonder why I should be referred to, as I have no dealings in the shares, but from the reports circulated I would not be disposed to be a very large holder." The other said—"I do not advise my clients to buy, as the shares are in the hands of a certain clique, and there is a wide margin between buying and selling." This is no denial of the rich lodes and elvans that are in Terras. I had also a report from Capt. Charles Thomas, and this was highly appreciated by the promoters and by large holders of shares in Leeds. He says the elvan is rich for tin, and if economically and energetically worked will pay, and that the strata were congenial for tin, but the lodes are said to be rich, and in his opinion in depth will be a far better speculation than the elvans. What, also, of the opinion of Messrs. Henwood, Pope, Nancarrow, James, Lean, and about six more of the best miners in Cornwall? Their reports are very cheering indeed, and is Mr. Marlborough a competent authority in such a matter? The meeting at Grampound-road was to show the shareholders what was going on at the mine, and it was open to everyone. Telling me there would be no dividend declared is a myth, and as to the financial position of the company the directors are satisfied. The managing director and others connected with the mine are men of upright character. J. ADDISON.

Ormiston, Feb. 6.

TERRAS TIN MINE.

SIR,—Few things are more scarce in this world than a strict regard to Truth, and it has been evidenced largely in the case of the Terras Mine. While one broker assured the public 16 months ago that the shares were then worth 3*l.*, and strongly pressed them at that price, others have as pertinaciously stated that they would not pay at the original cost. My experience is that shareholders who have bought wisely at 25*s.* to 30*s.* per share will receive in the dividend now declared interest at 5 per cent. per annum on their invested capital, which, considering the years that many mines have been worked before they have paid at all, appears to me satisfactory.

Mr. Marlborough, in last week's Journal, expresses his hope that he may live to see a second dividend declared. Considering that the first dividend of 7½ per cent. has been fairly earned in the year from the commencement of operations, that very great progress has been made in opening out the most valuable parts of the mine, that the manager and directors have gained experience as to what parts of the mine can be worked to advantage, the stamping machinery is now nearly doubled as compared to a few months ago, and is likely to be further largely increased—everything, it is hard to believe that the doubt of Mr. Marlborough's honest desire for the safety of the public, but it looks more like depreciate a legitimate and valuable property; nor can I see why queries a few weeks ago Mr. Marlborough should impute want to the contractor or the mining captain, whose management has so successful in eliciting the value of the mine.

Feb. 6. A BONA FIDE SH

TUOLUMNE GOLD MINING COMPANY.

SIR,—The directors of the Tuolumne Gold Mining Company just had their attention called to a letter, signed "Shareholder," piement to last week's Journal, stating that the market price (fully paid) is "somewhere about 5*s.* per share," desire me to fied contradiction to such statement, and to add that they having been disposed of under the full par value of 2*l.* per share have, moreover, not only kept the full amount of their original bought others lately at par; and as it is to the general interest holders to fully develope this fine property, rely upon their co in subscribing the small balance required for working capital.

Feb. 6. E. W.

PINTO MINING COMPANY.

SIR,—In the Supplement to the Journal of Jan. 27 a sanguine endeavours to satisfy himself and the general public with the pe spects of this mine. It would have been well in the interest that he had "watched" yet another week, and read the letter Mr. Thomas White, of Mineral Hill, Elko county, Nevada, wall, who gives a different and, to my mind, a deplorable view character of all the mines in this and the White Pine and Pinto information is also further endorsed by your correspondent, "T date The Pinto directors may "court enquiry," but they c alter the character of the district in which they have embarked improbable that an enquiry may eventually be made both in Great Western Company, that your correspondent refers to, as parties figure prominently in the executive of both, though they may not come to be classed in the same category. Still, both, and we opine that, notwithstanding capital is still Colorado and Californian sound ventures, no sane man in Lon venture one shilling in the once much-vaunted White Pine pock

AN INVESTOR IN AME

[For remainder of Original Correspondence see to-day's

INORGANIC ANALYSIS BY FLAME REACT

SUPPLEMENT TO WATTS'S DICTIONARY.

To afford anything approaching an accurate view of of a dictionary is extremely difficult, however length may be given of it, and this difficulty is certainly not when it is a Supplement* expressly written to record the science of chemistry since the publication of a w admitted to be exhaustive at the date of issue. This extends over 1136 closely printed pages, and may, the garded as forming a monument to the progress of the s the past few years, and to the industry of the author of but this very circumstance compels us to be content to give a the general contents, and then direct attention to one or two articles to show the mode in which the several subjects are treated of inorganic substances by flame reactions, being a subject in w interested, we will select that for abstract.

Amongst the longer articles which the volume contains referen to those on Acetic Acid, Acetylene, Acids, organic, and Alcohols plying an enormous amount of information in as condensed a f compatible with utility. Again, in about a dozen pages on Anilin are given which will be interesting even to the non-scientific re may be said of the article on the Aromatic series; yet it must no that either these or those on Benzene, and on its homologue, am wanting either in accuracy of technical detail or thoroughly syste ment. Considerable space is devoted to the articles on Electric of Gases, Heat, Iron, and Light, all of which will be of much readers of the Journal, and they will not read without pleasu ticles less closely connected with the branches of industry with immediately concerned. And passing on to near the end of the with the article on Sulphur, which substance has been very ex gated during the past few years, and find evidence of considera been taken to record every newly ascertained fact that has bee time made public by the several discoverers.

Returning to the article on Inorganic Analysis by Flame Reactio will suffice to show its value. From it the reader will learn the tions which can be obtained with the blow-pipe can be produced ease and precision in the flame of the non-luminous gas-lamp (a which is given). This flame, moreover, possesses several poin render it available for reactions by which the smallest traces of o occurring mixed together can be detected with certainty whe and even still more delicate tests fail. After describing the varie flame by the aid of a suitable diagram, it is explained that the in the flame used in the reactions. At the base of the flame the comparatively very low, as here the burning gas is cooled by the rent of cold air, and much heat is absorbed by the cold end of t If mixtures of flame-colouring substances be held in this part of often possible to vaporise the most volatile constituent, and thus moments to obtain tints which cannot be observed at higher tem cause they then become masked by colours produced by the volati remaining substances. The zone of fusion lies somewhat above of the flame in height, and midway between the inner and outer mantle at the point where the flame is thickest. This is the po which possesses the highest temperature, and it is, therefore, substances as regards their melting point, their volatility, their as well as for all processes of fusion at high temperatures.

The lower oxidising flame lies in the outer margin of the cone is especially suitable for the oxidation of substances dissolved in salts. The upper oxidising flame is formed by the highest po luminous flame, and acts most powerfully when the draught hole are wide open. This flame is suited for the oxidation of larger stance, for roasting off volatile oxidation products, and general cases of oxidation in which an excessively high temperature is lower reducing flame lies on the interior edge of the mantle, n central zone. As the reducing gases at this point are mixed wi mospheric oxygen, many substances remain here unaltered, whi oxydised on exposure to the upper reducing flame. This point of therefore, very valuable reactions which cannot be obtained with It is especially available for reductions on charcoal and in bead The upper reducing flame is formed by the luminous point pro dark zone when the admission of air is lessened by the consider draught holes. If this luminous point be made too large it will a test tube filled with cold water, and held there, becomes cov of lamp-black; this ought never to occur. This flame is especia reducing metals when it is desired to collect them in the form of

The various parts of the flame having thus been described, the e amination in them are fully explained, particular care being t out the special arrangements that must be made in dealing wi stances. Thus it is observed that the quantity operated on must the platinum wire not thicker than a horse-hair, and that substa on platinum, or which will not adhere, must be heated on a thre Decrepitating substances are ground to the finest powder on a p with an elastic knife-blade, and drawn up on to a moistened str centimetre of filter paper. If the paper be then burnt, being held rings of fine platinum wire, the sample remains as a coherent cru may without difficulty be heated in the flame. The mode of deal stances which require to be heated for lengthened periods is expla then shown that with this one flame the effect of various tempe red heat, commencing red heat, red heat, commencing white he and strong white heat—upon various substances can be ascertain

The several phenomena observed when a sample of a substance then described, and the modes of observing the emissive power, de melting point, ascertaining the volatility, and noting the flame co carefully described, and having thus afforded a thorough knowle haviour of the elements at high temperatures, the writer gives co information concerning the oxidation and reduction of substance means. The third section of the article is devoted to the consider reactions of the elements. The elements, it is remarked, while recognised by their flame reactions, are arranged into the following sub-groups, according to their behaviour in the reducing and oxidis

A.—Elements reducible to metal and deposited in films.
1. Films scarcely soluble in cold dilute nitric a id—bellurium, antimony, arsenic.
2. Films slowly and difficultly soluble in cold dilute nitric ac mercury, thallium.
3. Films instantly soluble in cold dilute nitric acid—cadmium, l

B.—Elements reducible to the metallic state, giving no film.
1. Not fusible to a metallic bead.
   a. Magnetic-iron, nickel, cobalt.
   b. Non-magnetic—palladium, platinum, rhodium, iridium.
2. Fusible to metallic beads—copper, tin, silver, gold.

C.—Elements most easily separated and recognized as compounds titanium, tantalum and niobium, silicon, chromium, vanadium, uranium, sulphur, phosphorus.

Then follows a description of the special flame reactions for each pounds, and there is a very valuable table of volatile elements whi duced as films.

From this outline of the article on Inorganic Analysis Reactions, it will at once be seen that the subject is treate haustive and thoroughly practical manner; yet this form of almost innumerable articles of equal utility and int Supplement alone contains an amount of information, into a comparatively small space, which is really marvel regarded as part of the Dictionary, will make the entir nearly perfect as need be desired. It may well be regarded substitute for the most judiciously selected chemical could be purchased for ten times the price at which the volumes are published.

* "A Dictionary of Chemistry, and the Allied Branches of other S By HENRY WATTS, B.A., F.R.S., &c, assisted by eminent contributors ment. London: Longmans, Green, and Co.

Royal School of Mines, Jermyn Street.

[FROM NOTES BY OUR OWN REPORTER.]

CTURE XVIII.—Our last lecture (said Mr. SMYTH) concluded inting out to you the different materials of which borers are and the forms given to the "bit," or cutting part of the borer, ing out more particularly the great advantages which had ed from the use of cast-steel; and that in the limestone rock, of which have a hardness scarcely inferior to that of steel, they oy very sharp bits, while in the granite and older clay-slate rocks se bits with cutting edges of much greater bluntness. Taking granted that you know enough for the present of the bore-holes, modes of making them, we will now proceed with the subject, and see is to be done as to lodging the charge at the bottom of the bore-holes. The tion of putting down a bore-hole is an exceedingly laborious one, requiring hours' work to reach a depth of 1½ to 2 ft., or with a double-handed borer ft. It is easy in certain districts that the use of single-handed borers is p—as, for instance, in some of the softer lodes of Cornwall, and in the bourhood of Dolgelly, in Wales, where the men being used to it two will greater amount of work than the same number with a double borer; but in er ground the double-handed borer, with its larger bit, comes into play, nables them to lodge a larger charge at the bottom. Supposing, then, our is to blow off a piece of rock, and we have put in a bore-hole in the proper for producing the best effect, and the ground contains water, it is necessary to employ a water-tight cartridge, and to "pay," or "ball" the hole. The is done by driving in a piece of clay so as to fix it all round the internal and fill up the interstices; this has to be repeated once or twice before the a thoroughly water-tight. Then comes the explosive material to be employed, on which a great deal might be said, as several kinds are just now on trial, it may be said, both in this country and in others. Here gunpowder ally used, and although of various kinds they do not differ much. There ark and light coloured powders, and powders with various sizes of grain, s is only by trying them that anything can be known of their relative gth. In some nitrate of soda is used in the manufacture instead of saltand this has been brought forward of late years, the object being to obn explosive at a lower price. The most distinct step in the way of imments, however, has been the invention of gun-cotton—first as a loose cotwhich had to be tamped down, and secondly as gun-cotton rope; the latter ced by M. Austin, an engineer officer, and improved by Mr. Prentice, of market. [The lecturer exhibited specimens.] This being made in conent lengths, may be placed one over the other to the height required, or in timsons rope may be cut by the men to suit their necessities. Experiments practical kind have been made with gun-cotton in certain districts, and it nd to have an advantage over gunpowder, because it contains an equal exe force in a much less space. After the explosive is placed at the bottom emainder of the hole is filled up by tamping, so as to equal in resistance ock as the sides, otherwise when exploded it will not act on the sides, but out the tamping-like the charge from a gun. When you remember what is site for good tamping, you will perceive that the smaller the explosive at ottom the larger and more perfect the tamping; and, therefore, what a advantage in that respect gun cotton has over powder. The respective es are proportioned in something like the following manner:—When the ole is 1-26th of an in. in diameter 6 ozs. of powder will go into a space y 7 in. long (to be exact, 6·96 in.); while 1 oz. of gun-cotton, which does the same amount of work, occupies 3·84 in., so that there are 3 in. more able for tamping, and producing a greater effect on the rock.

other explosive of great importance—nitro-glycerine—has lately attracted ation, not so much by the work it has done, but from several disastrous acts arising from the carelessness with which it has been treated. Unforely, the good is often condemned with the bad; and Parliament, startled n accident in Wales, which showed the destructive power of this material, ed the trade in these new explosives, whereas it was in reality a great to the miner. M. Nobel, however, has discovered a safer form of nitroerine, called "dynamite," which has been introduced and largely employed merica, under the name of "the giant powder." One peculiarity of this der is that a little might be burnt on the palm of a man's hand without , whereas an extremely small portion exploded by a detonating cap has xplosive power greater many times over than the best gunpowder. Prof. of Woolwich, has determined by experiment the fact that the employment detonating cap in exploding gun-cotton produces a similar increased effect. reason why the loss of nitro-glycerine is regretted by miners is that when bore-hole was made they could fill it with water, and then pour in the e of that material, which from its greater specific gravity would sink to ottom. All they had then to do was to put in a piece of fuse with a cap at nd, by which it would be fired with tremendous effect, no tamping whatbeing necessary. By this means all the accidents which are so prolifically nced by ordinary tamping were avoided.

will next refer to "tamping," which is a most important part of the opern of blasting. In the early days of blasting with gunpowder (and as may en now on the Continent in places where they are not much accustomed to hey drove a plug of wood over the charge, and put in it a sheet of iron ily weighted down with stones. This shows the principle of tamping, but details in later times are different. In putting in the powder it is important none of the grains should be scattered on the interior sides of the bore-; and if the hole is to be formed after the old fashion, a mode still largely ogue in many districts, what is called a "shooting needle" has to be introd through the tamping. It should be made of copper, and not of iron, a ter of great importance, although, unfortunately, shooting needles of iron inue to be made. In fact, copper ought to be obligatory, and men ought willing to abide by rules made for their own safety, but in practice there eat difficulty in making men pay any attention to rules, and it is quite astoing the number of accidents which take place from neglect of these and equally wise precautions. The "shooting needle" reaches from the surdown to the charge, and is to be drawn out after the hole is tamped, in to introduce some means of firing the charge. The material with which ole is to be filled up is then put in bit by bit, and driven down with the ping bar, which is simply a bar of iron—the ramrod, as it were. It is often en down with a hammer, so as to force the material into as close a connecas possible with the sides and bottom, so that it may make the greatest reance possible to the effect of the powder. It often happens that some grains of er are carelessly left, which are fired by the blows of the tamping iron, and municating with the charge at the bottom the explosion takes place prematy, and the operator is killed or maimed, or loses his eyesight. The remedy this is to have the tamping-bar tipped with copper, and this especially in mines, where the rocks are of a quartzose character. As to the tamping f, besides the plugs I have mentioned cones have been employed, which edging together give the gunpowder time to produce the greatest effect, other expedients have been tried, but there is nothing so efficient as some material, well driven home. It was, however, announced in the early part no present century that loose dry sand had been by certain French officers of neers found an excellent tamping in certain operations they carried out in ing the Simplon with the army of Napoleon I. The sand, however, must ry, and the theory is that the effect of the powder is to force or drive the s of sand against the sides of the hole, and so the explosion is delayed in direction of the orifice, and acts with full force at the bottom. If the sand yet it is simply thrown out like a cork.

is usual for miners when they see any suitable clay to take it home with them put it on the "nob" of the fire, and this, when slightly baked, is found to n efficient and at the same time a safe material. The great thing is, whatr material is used, that it should be free from gritty matter, or grains of rtz, which are likely to lead to accidents. Pounded brick answers the purvery well, and some miners have tried pure galena, but this is waste. he next thing is to pull out the needle and put in some sort of a fuse. This ration has been productive of so many accidents, and the miners have so al a tendency to employ iron needles, that various substitutes have been atpted. Copper and even wooden needles have been tried, but the best move- in this direction is the invention of the "safety-fuse." This may be cut any length to suit the depth of the hole. It is put in before the tamp, and s not require drawing out, as the fire is conveyed through it to the charge. in ordinary cases, when the needle is drawn out, the fuse put in consists metimes of straws or reeds, or some other like contrivance, which is fired by a match to enable the miners to reach a place of safety. The great danger this plan is that when for some reason the charge does not go off, or hangs , the men go back to see what is wrong, when the explosion takes place, and ir lives are sacrificed to their impatience. And even supposing the fuse to e failed, the miners will often begin to bore out the contents in order to use t hole again, and with an almost certainty of a fatal explosion. In some ntries the attempt to use an old unexploded bore-hole is entirely forbidden, le in England it depends upon the regulations of each particular mine.

has been suggested that a great deal of this sort of work might be got rid y the introduction of suitable machinery. A great deal has been said of ing out tunnels and drifts, and the like, and an extraordinary number of entions have been brought out and patented in this country and America for ting out whole drifts at once, or, more modestly, for boring small holes for ging explosives. The history of most of these has been one of failure. But, the other hand, when it is intended to use gunpowder, and inventors only purtheir time taken up in boring the hole, there have been some great cesses, so far as experiments have gone; but whether they would still prove esses if brought into use in ordinary mining it is yet doubtful. In certain ptional works on a large scale there have been, no doubt, great advances he last 12 years. Foremost amongst these is the invention of M. Sommallier, ch was afterwards improved upon by an excellent mechanician named mans. His plan was the same in principle as that of Sommallier, but put a better form. The borer was, in fact, attached to the end of a piston, and pressed air was used instead of steam. By this means it was found that n at work 150 to 180 blows per minute were given, the bit being turned after blow, its edge being in the form of a reversed Σ. This has proved itself to n excellent machine, as it has been employed in several of the most important ks of modern days, as for instance, at the Mont Cenis Tunnel, where the first -hole was 9 ft. square, and eight cutters were employed simultaneously. M. ing, of Westphalia, has introduced some modifications into this machine, his plan has been adopted at several continental mines, and especially at mines of the Vieille Montagne Company, where it is found in opening out dolomite limestones a rock of great hardness, they are enabled to do twice amount of work done by other methods. I can speak of this machine with y, for Mr. Max Braun has given me some reliable particulars as to its work. ing's machine has long been at work in the Tincroft Mine, in Cornwall, at ses. from the surface, and in the Dolcoath Mine more recently; but in neither has it been quite a success. M. Doering undertook to drive certain levels at same cost as by hand labour, but there was a want of effective supervision, a considerable number of breakages and misfortunes had proved great drawcks to its perfect success. Other machines of a similar character are employed weden and in America, but they are open to the same kind of statement. y have apparently been successful in experiments, but we can never tell ther a machine is perfectly applicable to real work until it has been put to work, and kept at it for some time. The great difficulties arise from the distances over which the motive-power has to act and breakages, which to be inevitable. In 1860 a diamond bit was proposed by M. Leshot, and a deal of work has been done by it. I cannot say whether it is more economical than other plans, but it has been found to be very useful. In this country Capt. Beaumont, of the Royal Engineers, has taken it up and carried it out; and in America certain assignees of the patent have employed it to a great extent. Messrs. Rossiter and Raymond, in their official report to Congress on the Mining of the Western part of the United States, state that it has been tested thoroughly in the Pennsylvanian coal field, where, it being desirable to put down a vertical bore-hole to the depth of 104 ft., the work was done in 6 hours 47 minutes, 46 ft. being through shale and coal, and 58 ft. through hard anthracite. Thus, even if it cost more, it is a great advantage to be able to work in time of necessity at this immense speed. At Festiniog some portions of an inclined shaft, slanting at an inclination of 40°, were opened with great rapidity with this machine and gunpowder—that is to say, a number of holes were bored, and then the machine withdrawn. The holes were charged, and the shots made, after which the men squared up the end. The machine was then replaced, and the operation repeated. In judging of this class of machines, it must not be forgotten that, however applicable they may be when there is a sufficient amount of space, as in the Mont Cenis Tunnel, and other large works, what is wanted is a greater degree of applicability to the working plans of ordinary mining, without which it cannot be said that machinery has been fairly brought into competition with hand labour.

LECTURE XIX.—There are, as we have seen, other materials for blasting besides gunpowder, but none of them have as yet proved so satisfactory as to displace it in common mining work. We have also seen that want of space and other difficulties interfere with the introduction of apparatus of a mechanical kind instead of the ordinary methods of boring by hand and blasting. There is no question, however, that under certain circumstances some of these methods are very applicable, and it is also noticeable that with nitro-glycerine and dynamite an amazing amount of work may be done, even with holes of an extremely moderate size. All these are very important subjects, when it is remembered that the greater part of the expenses of mining is for labour. Before proceeding to certain other questions connected with blasting, a few matters require attention relative to the direction in which the lode or mass ought to be bored, a proper appreciation of which nothing but actual practice can bring home to us, so as to avail ourselves of the various complicated considerations which have to come before the miner. A few points, however, will be almost self-evident. The first thing is to determine "the line of least resistance," or the direction in which the powder will take the greatest effect. This is generally, in a military mine, a vertical line reaching from the centre of the charge to the surface, or the shortest line to the open air, and the charge is proportioned according to the ratio of the cubes of the lines of the least resistance. But when we come to mining, the line of least resistance is not always the shortest. Almost all rocks are more or less fissured by joints in the vein, and a close observation of the direction of these fissures and other circumstances will show where the blast should be placed, and it will frequently be necessary to cut away a portion of ground for the purpose of making the bore-hole in the most effective spot. When the rock is of a broken character, and the vein of a vughy or cavernous nature, blasting is more difficult, and costs considerably more than when the rock is firmer. The principal thing to be observed is how to place the bore-hole so as to bring down the largest quantity of material. Except in certain rare cases of homogeneous ground, there are sure to be joints, or cleavage, or cracks, and even in metalliferous veins, when there is no distinct stratification, there is often a tendency to cross joints, or "queers" as they are called. Suppose these joints are dipping towards you, it is clear that they will greatly assist the operation of blasting, and, therefore, the charge must be put in so as to blow out a little nick across the bottom, and then proceed to put in bore-holes at the top, which in succession will take out considerable portions of the rocks with great advantage. Experience alone can be the guide as to suiting the direction of the bore-hole to the direction of these "queers," and the miners themselves generally, although in different degrees, will be found competent to deal with these questions, so as not to throw away a shot. This is important, because in very cavernous rocks the powder may blow away, as it is termed, into the cavities without producing an appreciable or proper effect. In the South of France when working in limestone diluted acid is dropped into the bore-hole to dissolve the rock, and thus enlarge the bottom; by this means a much heavier charge of gunpowder can be placed in the bulb, as it were, of the opening, and the shot is greatly increased in efficiency. Further than this, it has been suggested that if an air space could be secured around the charge its expansion would assist materially the force produced by the explosion of the powder, but this is better in theory than in practice, as in effect it has a tendency to shoot out the tamping rather than blow away the rock. Another plan has been used somewhat extensively in some districts—to place a wooden wad in the bore-hole hollowed to receive a charge of gunpowder, but it is not desirable, on account of the additional trouble it gives the miners. The explosive force of gunpowder has been the subject of much experiment, particularly by military engineers, and they have determined pretty accurately the exact effect produced in a certain class of ground by a given charge of powder, but when the object is to remove blocks from their beds for the purpose of forming a breakwater, like that at Holyhead, it has been found that very large charges are required. The amount of gunpowder required is measured by the effect you desire to produce, and if that is to make a crater of parabolic form the charge should be in proportion to the cubes of the line of least resistance. Thus, if we take the line of least resistance to be 6 ft., and find by experiment that 2½ lbs. of powder are required to produce a given effect, than a 7 ft. line of least resistance will require 35 lbs.; or, to put it another way, $6^3 : 22 :: 7^3 : 35$. In the same way if the line of least resistance were 12 ft. the charge will not be double that at 6 ft., but as the cube of 6 is 27 lbs., so that the cube of 12 will be to the result of 176 lbs., or $6^3 : 22 :: 12^3 : 176$. The increase, therefore, of the charge is extremely rapid, and ranges from a few pounds in weight to several tons of powder. Indeed, if larger charges were used more than they are they would in many instances be productive of great advantage, especially when we want to get rid of cumbering rocks. In many of our slate quarries, for example, there is overlying material from 20 ft. to 60 ft. or 100 ft. in thickness, which, whether greenstone or bastard slate, must be got rid of as rubbish; and it is therefore important to remove it as readily and economically as possible. It is always important that economy should show itself when large masses are to be dealt with; and if holes are put down by which instead of a few ounces many pounds of explosive material can be used the work is greatly and economically expedited. Experience has shown that under certain conditions one bore-hole sunk as deep as two shallow ones put together will produce more than double the effect of the two. Thus, at the top of a quarry where there may be 40 feet of over-matter to take off as waste, holes as deep as 8 ft. are bored, and large blasts put in. It is in such cases that large charges are found to be an enormous gain, and during the last 25 years some remarkable operations have been carried out in this way.

Dr. Franklin long ago proved the possibility of firing gunpowder by means of electricity, and to this Sir C. Pasley owed his successful attempt in 1839 at blowing up the Royal George at Spithead. Several charges of gunpowder were skilfully placed in the wreck by divers, and fired simultaneously by a galvanic battery. Since that time electricity has been applied in practice very generally in such operations, but not so much in mining as it deserves to be. There was an idea prevalent that the apparatus was cumbrous, and that much scientific knowledge was requisite, and the like, but this really is not the fact. The mode of firing cartridges by these means is very simple. Two extremities of the wires to be connected with the negative and positive poles are enclosed in a small tube, and having between their ends a thin platinum wire or other substance (which can be strongly heated by the electric current), together with some fine sporting powder as an igniting cartridge, and placed in the middle of the charge. Smaller cartridges, or "fuse fires" as they are called, can readily be made at the mine, or purchased ready made at a cheap rate. A very neat and effective cartridge is that prepared by Prof. Abel, of Woolwich, at from 2s. to 4s. per dozen, according to the purpose for which they are required—whether merely for experimental purposes, for mining, or for under-water explosions. The galvanic battery is the instrument most commonly used, and it only requires the precaution of fixing it well out of the reach of the shot. Sir Charles Wheatstone has devised an electro magnetic machine which is handy and portable, contained in a box about 1 ft. long, 8 in. deep, and 6 in. wide. It can be bought at prices of about 10 or 12 guineas. These machines obviate the dangers to which the miner was exposed, under the ordinary system of blasting, from misfires. The men run back much too soon to see what is amiss, and reach the spot not unfrequently just as the delayed explosion takes place, and thus lose their lives or are maimed.

There is another and an entirely different mode of acting upon rocks of an extreme hardness known as "fire-setting," which was once extensively used on the Continent. It was formerly much employed in Hungary, but it is now kept up chiefly in Felso-banya in that country, at Rammelsberg, and Goslar, in the Harts, and in Norway and Sweden, where it is practised to great advantage. It was, no doubt, known to the Romans, and you will all recollect in crossing the Alps Hannibal employed fire to remove rocks out of the way of his army. Pliny, at least, uses the phrase with reference to mining "igne et aceto rumpunt," which implies that the Carthaginians broke the rock by that means. If the circumstances are all favourable, systematically arranged piles of wood are heaped against the face of the workings, generally on Saturday nights, in the Harts and fired. In half-an-hour after the heat becomes fairly operative, small explosions begin to be occasionally heard, and the rocks come down in flakes. By Monday or Tuesday morning the workings are comparatively cool, and the miners often find as much rock displaced or fissured as will occupy them two or three days in removal. These operations are again renewed, and so on. By this means rocks which will scarcely yield at all to ordinary methods of attack are worked with great economy in these countries, where, however, it must be borne in mind that fuel is exceedingly abundant and cheap. In Transylvania levels are actually driven by means of this process, but it often leaves vast masses of roof in an insecure state, and must be a constant source of danger, requiring the greatest care and circumspection on the part of the miners. At the mines of the Kongensgrube and Königsberg this system is worked out with great skill, both as to the firing and ventilation, at very considerable depths, and in comparison with the other methods at a saving of 20 or 30 per cent. The arrangement here adopted converts the shaft into an immense chimney, 244 fms. in height, and a column of air reaching the fire from the drift a splendid combustion is kept up. It has one great advantage, that of rendering necessary a more special attention to ventilation, and the maintenance of a vigorous current of air. At Felsö-banya, which is the most remarkable place in Europe where this system is adopted, and where the operation is confined between the two sides of the lode by the use of an iron frame for the fire, called pregelkatze, the quartz, hornstone, and greenstone which form the lode, although especially hard, are brought down with great regularity and effect. At places when the lode is large masses of hundreds of tons sometimes fall in from the roofs and by this mischance large cavities are formed—too large to be secured by ordinary means. The only way to deal with such accidents has been found to be that of filling in the space with refuse properly packed, without which the miners will always work under these circumstances with difficulty and danger.

MINERAL WOOL.—At the Manchester Literary and Philosophical Society, Mr. Brockbank exhibited a specimen of mineral wool, produced at the Conshohocken Ironworks, in America, by passing a steam-jet through a stream of molten slag in its flow from the blast-furnace. It had a lustrous white fibre, singularly like cotton-wool from the pod. It can be made at a very trifling cost, and is likely to come into use for several purposes. It is said to be a very effectual non-conductor of heat, and this has led to it being used in the United States for the coating of steam-boilers, and for the linings of refrigerators. Similar mineral wool is sometimes produced during the blowing in the Bessemer steel converters, but only in small quantities. Mr. Brockbank also described a very simple mode of utilising slag, adopted at the George Maria-Hutte blast-furnaces, at Osnabruck, in Hanover. The molten slag is allowed to fall in a stream from a height of about 8 feet into water, and is thus formed into large bean-shaped gravel. From the water tank it is lifted into railway trucks by "Jacob's ladders," and is conveyed away as fast as it is produced, and largely used for metalling railways. In some of the English ironworks the slag is now being broken up by Blake's stone-breakers, and sold for metalling roads; and in this way it proves a source of profit, instead of being a considerable loss in its usual form of huge heaps of slag disfiguring the country. The Bessemer slags of the hematite furnaces are found to make excellent concrete, on account of the large quantity of lime they contain; they are also peculiarly suitable for manuring potatoes and barley, as they fall to powder under the action of the atmosphere and yield up their silica and lime to enrich the land.

IMPROVEMENTS IN THE MANUFACTURE OF HOMOGENEOUS METALS.

The usual monthly meeting of the London Association of Foremen Engineers was held at Cannon-street Station Hotel, on Feb. 3, when the President (Mr. Joseph Newton) announced that Mr. Galloway would introduce the subject of his patented invention for improvements in the manufacture of iron.—Mr. G. B. Galloway then read the official copy of his patent for improvements in the manufacture of iron, which he denominated Iron-steel. The purification of the iron in its manufacture he proposes to accomplish by a specially prepared fuel, consisting of creosote and other dead oils, made into fuel with a mixture of duff coal breeze and the refuse of saw-mills and various waste materials and peat. This fuel will contain no sulphur, and will have the tendency to diminish the sulphur or phosphorus which ores generally contain, and, therefore, the first stage of manufacture will produce a purer process than when coals and coke are used. He also proposes to use zinc, tin, and lead in the mixture of metals as may be required to produce the quality of iron wanted. He smelts by intensified heat. He proposes to obviate the necessity for puddling by arranging the blast, which is to be superheated air and steam, in different jet pipes, which are to enter into the cupolas at various places. The air and steam pressure is to be varied and regulated by valve or stop cocks in the pipes, and the force of the blast will puddle up the iron. He also proposes that a branch pipe containing air and steam shall impinge upon the metal, which, by a circuitous route, he allows to run from the furnace, and by this process the iron will be further purified, and made into rolls or balls of the like consistency in heat, and thus be ready for the steam-hammer or the rolling-mill.

The reading of the specification was most attentively listened to, and at its close was applauded.

Mr. Galloway then said that it would be observed his patent specified a mode to make special qualities of homogeneous iron for ship and boiler plates, which iron would not be so much acted upon by the corroding action of water, and possess also other important properties of strength and toughness; and he also described the mode of making a special quality for armour-plates, rolled to V form on the horizontal sectional view. This outer form would be so tempered as cutting chisel steel that it would have the tendency to nullify or prevent the penetration of shot by breaking it up, while the mode of filling up the divisional spaces in the armour-plate with wood or other fibrous material would deaden and absorb the concussive effect of shot, and that such description of armour might be easily affixed and satisfactorily constructed, that he hoped it was destined that Providence had made choice of him as the medium to do for and effect improvements in the manufacture of iron which in their results would confer as great commercial benefits as had been produced in the manufacture of steel by that truly great inventor, Mr. Henry Bessemer.

The President then invited remarks and discussion of the subject matter of the invention, which gave rise to a most interesting discussion, in which Messrs. Gibbon, Hedley, Briggs, Irvine, Coates, and Ives took part. The discussion was continued till past 11 o'clock, and Mr. Briggs suggested that as the hour was so late Mr. Galloway should be allowed to reply at the next monthly meeting. This was agreed to, and Mr. Galloway said he hoped that the discussion would then be continued, for it convinced him he was right that it was interesting and important to all connected, and he would reply fully at the next meeting.

The meeting then separated, it being nearly 12 o'clock. The next meeting is looked forward to with much interest.

We purpose after the next meeting to give the points raised in the discussion and also Mr. Galloway's reply thereto.

THE PRESENT STATE OF THE SOUTH STAFFORDSHIRE COAL TRADE.

An ordinary monthly meeting of members of the South Staffordshire and East Worcestershire Institute of Mining Engineers was held in the Geological Museum, Dudley, on Monday. Mr. Henry Johnson, the president, occupied the chair, and there was a large attendance of members. The following gentlemen were admitted as ordinary members; Mr. Thomas Llewellyn, Netherton; Mr. Matthew Fletcher, Netherton; Mr. John Dunn, Netherton; Mr. J. J. Reynolds, Darlaston; Mr. E. Reynolds, Darlaston; Mr. John James, Darlaston; Mr. George Gilbert, Tipton; Mr. E. Lealan, Wednesbury; Mr. W. R. Powis, Walsall; Mr. W. L. Rhodes, Handsworth; Mr. J. Williams, Walsall; and Mr. Dan. Rogers, Kingswinford. The following gentlemen were proposed as ordinary members; Mr. Samuel Britten, Walsall; Mr. David Plant, Pensnett; Mr. Richard Turnley, Withymoor; and, as hon. member, Mr. Wm. Madeley, secretary, Dudley and Midland Geological Society.

The PRESIDENT invited a discussion on the nine-hours movement in the coal trade.—Mr. JNO. HUGHES thought the nine-hours movement was almost an accomplished fact in that district, but the difficulties were not at present half understood, and the subject of the advance in charters and other expenses might judiciously be discussed. He thought the bandsmen wanted some relief, but a much better thing for the whole of the district—masters and men—would be better discipline for the latter in the pits. Much of the laxity was brought about by the fact that a collier had only to walk a few yards, from one pit to another, and he was at once employed, whether he had left the first pit properly or not. The men should have a character from the last pit.—The President said the wages question in the coal trade was an important one in itself, but it became doubly important when it was remembered that the staple trade of the district depended upon it. Prices had gone up, and wages had gone up; but who had benefited? With the exception of a few coalmasters, no one. The produce had decreased since the prices went up, and there was not so much coal being raised as there was in July last year. Iron had gone up 3l. per ton, but at present no one had benefited. The coalmasters did not reap the advantage; neither did the colliers, for they did not work half their time. It was a sorry picture to sketch, but two-thirds of the manufacturing produce was actually imported into their district, whilst they had plenty of it in the bowels of the earth themselves. The speeches of the men had been fully reported, but the masters had not explained to the public the position in which they stood. It was to be hoped, however, that the men would now settle down, and let all try to do the best under the new arrangement. In no district in England had the colliers so many privileges as they had in South Staffordshire, and in no place was the discipline so lax. No other collier had a ton of coal per month, had hot dinners sent down the pit, two quarts of beer per day, or pikes and candles found for him. In other districts, too, the collier was not allowed to do as he liked every Monday, he was kept to his regular work in other places like every other mechanic or artizan. He, for one, had always thought the bandsman deserved some lightening of his labour, but the pikeman's stint was easy enough, and he frequently went out of the pit with his day and a quarter or day and a half at 12 o'clock noon. The great question was economising the labour; but he did not see how, with the "pillar and stall" system, the plan of tonnage could be introduced. In the "long wall system" there was a chance of a subdivision of labour. He, for one, wished it was all done by the ton-working. Another instance of the discipline in that county was the fact that if a poor fellow was killed the pit played until he was buried. If the widow had no objection to the pit working, the employers ought to put a stop to such a stupid proceeding. Further, if a man or a boy was hurt, not a collier would lift him into a cart until the party to take him home had a note for 10 quarts of ale; and instances had been known where persons suffered acutely whilst the squabbling for the note was going on. Much of the lax discipline of the pit was due to these continual perquisites and privileges, and the sooner they were done away with the better.

Mr. MEACHAM said their principal difficulty was with the pikemen. The firm had agreed to make them an allowance equal to the eighth of the stint in time, but the men wanted the eighth off the stint itself. He had given strict orders that the men who did not work all day on Monday should not work at all, for the men took advantage of the two hours reduction on Monday, and made but half a day. He knew of a place where the pikemen could make 2½ days in a day regularly. When the stint was enlarged then they waited for the weight (superincumbent pressure) to bear down and loosen the coal after which he could fill his pit with men again.—Mr. LLOYD suggested that a printed form might be used and given to the men when they were legally entitled to leave.—Mr. NORTH said there was no arrangement made as to any specific reduction of the stint; it was to be in proportion to the concession to the bandsmen. The difficulty was brought about by Mr. Griffiths, the men's agent, who reported that the masters had agreed to take off one-seventh. This was reported in the papers, and on the same day it was also reported correctly in the trade article as he (the speaker) had stated. The concession to the bandsmen was between one-eighth and one-ninth of their whole time. He was in favour of a small printed certificate for the men having left.—Mr. LATHAM would rather see the pikemen have half-a-quarter per day added instead of the stints reduced, that would come to about the same thing, one-eighth.—Mr. LLEWELLYN considered that with the present reduction the pikemen were better off than the bandsmen.

Mr. SPRUCE compared notes with Mr. Meacham and Mr. Blakemore, showing that stints were not nearly so hard now as they were 40, or even 26, years ago. In some instances they had decreased fully a quarter, and sometimes a little more. Mr. Spruce then spoke in favour of regular work for the men as being the best calculated to make them steady, and argued that colliers would be better with the short hours if they would work every day. He should like to see a resolution passed to the effect that they refused to employ a man unless they knew that he had left his employment in a legitimate manner.—Mr. BLAKEMORE said two or three things were deserving of special notice. The first was the Monday question, and he thought it would be better that the butties should have strict orders that if a man would not work the whole of Monday, he should work until 12 for half a day. It had been the custom for the men to work until one for half a day, and now that two hours were taken off Monday's work let them have the benefit of one hour. He had set his face against any reduction of the stint. He knew of a case where stints were so easy that a pikeman, at 3s. 3d. per day, made 20 days in five days, or 3l. 5s. in the week; and yet it was said stints wanted reducing. In his opinion education among the miner

would result in great good, and they would be more easily managed, because they would be able to think as well as to act. Colliers ought to be compelled to give notice to leave, and they should sign their names or make their marks to such an agreement.—Mr. HUGHES pointed out that something of the sort might be inserted in the Special Colliery Rules; after which the dicussion was adjourned.

ON "GOSSANS."

The Miners' Association of Cornwall and Devon (of which Mr. A. P. Vivian, M.P., is President) held a district meeting at Brenge, on Jan. 12 (Mr. CUNNACK, of Helston, in the chair), when Mr. WM. ARGALL, of Great Huel Vor Mines, read an interesting paper on "Gossans," of which the following is an abstract:—

He defined "gossan" as a mixture of cellular quartz and earthy oxide of iron, often found in the upper parts or backs of mineral lodes, and spoke of the different varieties as sugary gossan, cindery gossan, irony gossan, &c. He remarked that he was not aware of the existence of any work specially treating of gossans, but that such writers as incidentally refer to them consider them to result from a partial decomposition of the upper part of the lode, subsequently to its original filling, however that may have been effected.

Mr. Argall quoted from De la Beche and other writers, to show that gossan was particularly characteristic of copper lodes, and that instances of copper ore being found in quantity in lodes, unaccompanied by gossan, was very rare. He also stated that oxide of tin was, in Cornwall at least, a very common ingredient in gossan, referring to Mr. Carne and other writers, as well as to the numerous old men's workings on the backs of copper lodes, in support of the statement. In Huel Daniel and Huel Spinster the upper part of the lodes, for at least 10 fathoms in depth, was taken out for the tin they contained; the lodes never yielding copper in any considerable proportion near the surface.

Mr. Argall stated that the backs of iron lodes often contained large quantities of gossan, extending to considerable depths from surface. He continued as follows:—The backs of tin lodes do not usually show so much gossan as those of copper or iron lodes, although in some instances in this district gossan has been seen at depths of 30 fathoms. It has been observed in the caunter lodes of this neighbourhood that when the gossan leaves the lode it changes into a hungry spar, and becomes poor.

At the Fowey Consols Mine the gossan has a general dip to the eastward. It is here accompanied by native copper, green carbonate, and grey sulphuret of copper, and is found above the bunches of copper pyrites, sometimes to a depth of 100 fathoms from the surface, on the incline of the lode. It should be borne in mind that carbonate of copper is readily soluble in acids, and precipitated by iron in the metallic state. This fact may perhaps account for the presence of native copper with the gossan.

The working miners abroad hold that no adventure is likely to be very satisfactory unless it has an "iron hat." In Cornwall many mines have been taken up solely on account of the supposed excellence indicated by gossans in which perhaps not a particle of the ore sought for is visible. In Cornwall, indeed, there is but little chance of meeting with copper ore at a less depth than 30 or 40 fms. If the gossan does contain small particles of ore no doubt is entertained of a rich mine in depth, although at Sharp Tor Mine gossan was found at 150 fms. in depth in which copper ore was perceptible, yet the concern was poor. This mine is in granite.

In lead lodes, associated with pyrites, it often happens that before the lead ore is reached the miners come upon a variety of green and brown gossans of different mineral and chemical characters. The miners discriminate between different shades of colour and degress of hardness and compactness. Thus, a hard brown gossan is thought to indicate ores of but little value; but a brown, of a particular tint, with a certain porous texture, indicates a rich deposit of ore. Agricola, who wrote in 1530, describes the Saxon miners as being quite alive to the different characters of gossans. Mr. Smyth observes that it is important to bear in mind that the gossans are produced by the decomposition of the upper part of the lode, and were not created as guides to the deposits beneath. The gossans are just such substances as might be expected to result from the decomposition of pyritous matter, much mixed with crystalline quartz. All pyritous substances are liable to decomposition from the effects of carbonic acid and water, and lodes in which minerals of that character are enclosed will naturally be greatly changed near the surface. We have thus to fall back upon our mineralogical and chemical knowledge to arrive at correct conclusions.*

Earthy brown peroxide of iron is often simply the gossan form of spathose iron, so important in the manufacture of Bessemer steel; but ordinary brown iron ore is quite a different substance, although chemically the same. Whatever oxide of tin was originally in the lode would naturally be found in the gossan, not being liable to decomposition from atmospheric agencies. The old men worked over the backs of the lodes for tin ore. In many countries the backs of the lodes frequently contain metallic silver and gold. In Mexico the native miners have worked for ages in gossans of a decomposed character, called "pacos," or (being much stained with oxide of iron) colorados, for native silver. This decomposition has often extended to great depths. I have already referred to the gossan at Fowey Consols, and I may here mention that at the Ting Tang Mine, in Gwennap, the gossan held down to about 150 fathoms in depth.

One of the largest lodes I have ever seen is in Perranzabuloe; it is about 90 feet wide. At or near the surface it is a mass of brown gossany iron; about 20 or 25 fathoms deep there are in the back patches of iron pyrites or mundic; the bottom is intermixed with blende. About 1¼ mile inland this lode, at or near the surface, is composed of white spathose iron; and about ½ a mile further on, at about 40 fathoms in depth, it produces blende in large quantities. If I may venture an opinion, I should say that it would produce lead in depth. Another large gossan lode that has come under my notice is at Great Dowgas Mine, near St. Austell. As surface it is many fathoms wide, and composed of dark brown, white, and black gossan, so cellular as to suggest the idea of being burnt up to a cinder, as the miners say. At the shallow adit the lode is 14 fms. wide, composed of gossan, white friable quartz, white carbonate of iron, pyrites, spots of yellow copper ore, and a little tin, but not enough to pay for working. At the deep adit is a great deposit of pyrites, in which is found blende, capel, spar, spots of yellow copper ore, and bunches of tin. At the 18 fathom level is a hard floor of quartz, no gossan, pyrites, copper, or tin ore. The 38 fathom level is the deepest point in the mine, and here the lode is about 6 fathoms wide, but has no distinct walls; it is composed of dark coloured killas, and chlorite (peach), but neither gossan, pyrites, quartz, copper ore, nor tin. Now, what is this lode—with its immense cap of gossan—likely to make in depth?

It has often occurred to me that we might, with advantage, retain specimens of all gossans in some central musenm—and get them analysed—as well as keep a record of the conditions under which they occurred. In this way we might gain some ideas which would lead us with more certainty to deposits of metallic ores. At all events, local collections might be formed to secure information gleaned by comparing gossans from rich and poor lodes.

The reading of the paper was listened to with much attention, and the specimens of gossan which Mr. Argall handed round for inspection, from Mona Mines, Anglesey, Great Huel Vor, Huel Metal, Great Huel Fortune, Carnmeal, Huel Rose, and the Perran Mines, were closely examined.

Mr. CUNNACK agreed with the writer of the paper as to the value of gossan as an indication of metalliferous deposits. He had observed that grossan was much more frequent when the lodes were in killas than when in granite.

Capt. HARRIS said that gossan was seldom an important indication of a good deposit of tin ore, and that he considered there were surface indications, such as the form of the ground, the direction of the cleavage planes in the slate, the existence of springs, &c., which were quite as important as gossan. He had often noticed that the poor mines were perched upon the tops of the hills

Mr. T. WILLIAMS had much more faith in gossan as an indication of copper than of tin. He had known instances of good gossans which where unaccompanied by deposits of either tin or copper ore, as at Sourton Mine, near Okehampton. He mentioned that the gossans of Devon had in some cases, to his knowledge, yielded small particles of gold. He had also observed that a fine slippery killas was not a good kind of country for copper; but that where the killas was rough, and not too hard, the lodes were rich, as at Devon Great Consols.

Capt. HARRIS had observed the same thing with regard to tin ores.

Mr. CUNNACK agreed with Capt. Harris as to the value of these so-called surface indications of metalliferous deposits, and mentioned that he had been for years working upon his faith in such observations at Tresavean Mine, in Gwennap. He approved of Mr. Argall's suggestion as to the collection and analysis of gossans, and suggested that a microscopic examination might be often of great service.

Mr. COLLINS quoted from Mr. Henwood's new work on metalliferous deposits, in support of the idea that the gossans were produced by a decomposition from above downwards. Mr. Henwood observes that gossans are seldom found at greater depth than 50 fathoms from the surface. In some places in Virginia a material much like gossan is apparently interstratified with talc slate—it contains gold, pyrites, selenite, galena, and pyromorphite. In France, silver, argentite, pyrargyrite, and kerargyrite are found in gossan. At Minas Geraës, in Brazil, specular iron ore is found, and some vughs are drusy with minute crystals of gold. At Guia Copper Mines, Chili, native copper, cuprite, melaconite, and malachite are found. At San Jose, calcite, malachite, and gold. In Ireland, gold, silver, copper, cuprite, chalcopyrite, hematite, and erubescite, have been noticed in the gossans; also small angular pieces of slate, encrusted with crystals of chalcopyrite. In North Wales, gold and ores of copper had been observed. At Menheniot, galena and barytes. All these instances of the occurrence of different mineral substances in gossan, were mentioned by Mr. Henwood, but he had himself observed native copper, chlorite and octahedral chlorite crystals—probably pseudomorphous after magnetite—in the gossan at Tresavean Mine, in Gwennap. Supposing a copper lode to have been originally of about equal quality throughout, and the upper part decomposed by atmospheric agencies, a transfer of copper would take place downwards, and this would tend to make the lower part richer.

After several remarks from Capt. BAWDEN, Mr. TYACK, and others, Mr. CUNNACK, in proposing a vote of thanks to Mr. Argall for his paper, advised the many young men present to lose no opportunity of making themselves acquainted with all that is at present known about gossans, and to try to add to the stock of knowledge on that subject.

* Lectures on Mining at the Royal School of Mines, 1871-2.

STONE-BREAKING MACHINERY.—The invention of Messrs. ORD and MADDISON, of Darlington, relates to certain improved apparatus to be used in connection with "Blake's stone-breaker," or other similar machine used for breaking stone or metal, as it is called, for road-making purposes, and consists principally in the employment in combination with such machine, one or more pairs of corrugated rollers of chilled iron or steel, through which the steam passes after being broken by the machine, and by which it becomes further broken or macadamised, and is rendered peculiarly fit for road-making purposes.

PAVING STREETS.—According to the invention of Messrs. TIBBITTS and FULLWOOD, of Notting-hill and Lee, coal pitch, or coal-tar, or other bituminous or asphaltic substance, is heated, and fine sand, burnt iron pyrites, or other such like mineral matter in fine powder is stirred in, also the lime waste of soap and alkali works and soda waste, which from the alkali they contain cause a better adhesion between the sand and the other materials; sulphur waste and common salt may also be used. Burnt or raw gypsum is then added, and the whole stirred together. The material in the form of powder is then made hot and spread on the road-way or surface, and rammed or rolled with heated rammers or rollers.

Meetings of Mining Companies.

BRONFLOYD MINING COMPANY.

The annual general meeting of this company was held on the mine, and, after inspection, by adjournment at the Queen's Hotel, Aberystwith, on Wednesday, Jan. 31. Lieut.-Colonel the Hon. C. S. VEREKER Chairman, and present a full quorum of members.

The notice of meeting, the minutes of the last general meeting, the balance-sheet, of which we gave a synopsis on Jan. 28, with the auditors' report thereon, having each been read and signed, the managing director, on presenting the Chairman with the register of the proprietors for signature, said that, although the register was an increasing one, showing that 253 proprietors held the 50,000*l.* stock of the company, it must not be supposed there are no large holders, because he might add that he and his colleagues, forming the board of directors, together personally held 16,322 stock, or about one-third of the entire capital.

The Chairman having affixed the seal of the company to the register, the following reports were read:—

AGENT'S REPORT.

Jan. 31.—At the last meeting (July 28, 1871) a bargain was set to nine men, to sink No. 3 shaft on the dip of the north lode, from the 84 to the 100 (16 fms.), to cut plat, put in penthouse, &c., for the sum of 266*l.* The plat and penthouse have been completed, and the shaft sunk 12 fms. under the level, leaving 4 fms. more to sink to finish this contract, which I hope will be completed in about six weeks from this date. The ground throughout this sinking has been of a very favourable character, composed of killas, carrying strings of spar, spotted with lead ore. The 84 is extended west from shaft 23 fms.; the lode throughout this drivage has produced lead ore from 1 to 3 tons per fathom, and the lode in the present end has a strong masterly appearance, and is well defined; six men are employed in opening and stripping down this lode to a width of 18 ft., at 120*s.* per fm., and the average yield of which is from 2½ to 3 tons of ore per cubic fathom. I have not the least doubt but that when the 100 is driven west a rich and equally productive lode will be met with. Balcombe's cross-cut has been opened south 9 ft. from this level, for the purpose of cutting the south lode, which has not been seen under the 52; and, should this lode keep its regular bearing, we may expect to cut it in about 15 fms. driving. I consider this to be an excellent trial, and should we come into a good bunch of ore it will add great additional value to the property. The 73 east is extended from shaft 8 fathoms 3 feet; the part of the lode opened on by this level produces from 10 to 15 cwts. of ore per fathom. Two men are employed in stripping down the north part of the lode from the shaft to the present forebreast, at 100*s.* per fm., and the average yield is about 1 ton per cubic fathom. The 73 west is extended about 26 fathoms from shaft; the lode in the end is worth 2 tons of ore per fathom. Six men are employed in opening and stoping the lode, at 120*s.* per fathom. The different stopes throughout the mine are worth on an average 1½ ton of ore per cubic fathom. The men hitherto employed in the upper levels of the mine have been assisting in levelling the ground for the extended floors, which are now completed, and in first-class order. The intermediate shaft of our crusher broke on Dec. 30, causing great damage to the 40-ft. wheel, by the falling of the crown wheel into the pit, and which has entailed great loss of time in our dressing department; however, I am pleased to say the machinery is being thoroughly repaired, and will be got to work to-morrow. We shall now keep the crusher at work day and night to make up for the loss of time. We have fully 40 tons of ore under the upper shed ready for the stone-breaker (Blake's), and the levels are full of the stuff which has accumulated in the interval. We have sold in the last six months 250 tons of ore, and with our improved machinery we hope to increase our returns largely this year. In conclusion, I beg to say the mine is looking well.—THOMAS KEMP.

MANAGING DIRECTOR'S REPORT.

Jan. 30.—The sales of ore for the past half-year, anticipated in my report of July last, have not been realised. This fact is a source of much annoyance, because it is the first time for many years that the result has left me open to a charge of over-estimation. The cause is easily explained, and at once let me say that it is not from a falling off in the intrinsic value of our property, but from the fact that the completion of the re-constructed floors and the erection of the additional machinery occupied fully nine months longer than was originally anticipated, and thus the ore could not be dressed, and the drawing it to surface became useless. The old flooring was laid out and fitted from 1853 to 1857, and the many years use had much reduced the value and indeed the efficiency of these fittings; furthermore, as years went by many new and improved appliances were successfully introduced to the public, and when the value of our mine became proved beyond question it was found to be essentially necessary to have new means of delivery and reduction. In 1869 these were commenced by the directors, but in the early part of 1870 it became my duty to consult the proprietary with a view to a complete reconstruction and re-levelling of the different stages of the surface, so as to get one floor self-feeding on to the next floor, besides the acquisition of all necessary appliances for the manipulation and dressing of our ores. To support this I prominently put forward that we possessed a property then yielding to us 2600*l.* a-year in profits, and that, so far as human foresight could predict, it would yield larger profit in years to come. Owing to this 8000*l.* further capital was raised, and I will now endeavour to show what has been done. The returns and dividends for the last four years stand thus:—

	Ore sold.	Money produced.	Dividends.
1868	Tons 482	£6024	£1200
1869	533	7175	2600
1870	594	7283	3800
1871	550	7353	4000

This mine is situate most favourably for complete and, as far as possible, self-feeding appliances, and the accomplishment of this, in the first instance, had prominent attention. From the crown of No. 3 shaft to the site of the old spalling-floors is a fall of 132 feet—hence the delivery of the produce of the mine through the adit was entirely changed, and drawn to the surface; an incline of iron rails was laid down on the face of the hill side, and over which full and empty wagons are now worked by a large drum and a wire-rope, delivering the orestuff into the pass to floor No. 1, whereby a saving of six men has been effected. No. 1 floor is covered by a shed, 60 ft. by 24 ft., formed of iron columns and galvanised corrugated roofing, outside of which is a 20 ft. by 40 ft. water-wheel, which pumps from No. 1 shaft, and drives under this shed a 15 by 7 in. Blake's stone-breaker. This machine delivers the broken ore by passes down about 17 ft. to the back of each roller crusher, and effects a saving of at least eight men in spalling. The next fall is one of 20 ft. to No. 2 floor, on the level of which are two crusher-houses, one containing a pair of new 38-in. rollers; the other is quite a new building, and contains rollers of 24-in. diameter, with all necessary appliances for the finer stuff. These crushers are worked by a 40-ft. diameter water-wheel: the first is self-feeding, six Remfrey patent jiggers, which are placed under a like iron-constructed shed, of 50 ft. by 16 ft.; the other is also self-feeding, a large compartment jigger, of a different construction (supplied by Messrs. Durie and Davis, Aberystwith Foundry), and, as these jiggers severally render the ore nearly clean enough for market, we may estimate that the labour and cost of 12 to 14 boys and girls is thereby saved. On this floor is also a self-contrived erection for classification of the slimes, and which, in its turn, acts as a self-feeder to the buddles of No. 3 floor, whilst the overflow of the classifier passes into a series of 12 brick-encased and concrete-floored slime-pits, each 12 ft. by 6 ft., the flow of the slimes in these several pits being checked, and a surer settlement of the finer-classed silver-grained ore obtained, by its having to pass through filters charged with ordinary gas-coke. Of the success which has resulted from these pits it is, perhaps, early days to speak too confidently, yet the realisation of 17*s.* 6*d.* per ton—irrespective of market price—over which the same ore, less cleanly saved and dressed, fetched two years ago, is an advantage everyone may appreciate. Having now described the mode and means of dressing our lead ore to this stage, your attention is drawn to Dingey's patent pulveriser, a machine recently introduced for grinding up the waste or *debris* of tin mines. The following is a description as given by the patentee:—

This machine is constructed of an iron pan, 6 ft. diameter, with vertical sides, into which are 12 holes, 15 by 5, fitted with fine punched copper-plates or wire gauze; the inner part of the pan is portable plates or shoes, made of the best white iron, and easily replaced when worn out; in this pan are four revolving plates, shoed in like manner, these are 2¼ feet diameter, and revolve about 200 rounds a minute, these moving with the sun, whilst the pan revolves against the sun by means of a pinion wheel working in the outer edge of the pan, so that the bottom plate is always changing its position, and thus prevents the possibility of wearing in grooves.

The machine is set in motion by the motive power connected to the horizontal shaft. This drives a vertical shaft with a spur wheel working the four pinions connected to the spindle which drives the runners in the bottom of the pan.

The machine is fed by means of a screw working in a hopper, which passes the stuff to a round launder (where there is a stream of water brought in), and from thence it passes in near the centre of the revolving plates, and is immediately carried under these, and is ground and sent through the grates with great rapidity, caused by the centrifugal force of the water from the revolving plates, when it is received into a launder conveying it direct to the buddles.

The machine is so constructed that it can be bolted down anywhere to a foundation and set to work immediately, or it can be made in light parts for exportation to foreign mines. A 10-inch cylinder engine is capable of driving it, or it can be driven with water-power where convenient.

The *debris* or raggings of a lead mine are generally thrown away; repeated assays of Bronfloyd raggings have been made from chance selections, which have averaged a yield of 3½ per cent. of lead. On this head it was well said by the Editor of the *Mining Journal*, in recently describing another patented process, that "the improvement of our existing appliances in mining, and the saving of the mineral now so extensively going to waste, is certainly the most important task before the scientific miner, in order to enable us to maintain our present flourishing position, or, on the other hand, to tide over another period of depression, should such again unfortunately occur." When my attention was drawn to this machine I was led to enquire into its applicability for reducing lead waste, considering that if low produce tin stuff would pay to reduce, why should not the less refractory lead ore scimpings be subject to further reduction. We started a machine to work yesterday, driven by a new 24-ft. water-wheel, and it is a report that not a single hitch occurred in its work. The that the machine will reduce to powder 1 ton of lead ra it is his opinion that it will reduce all the waste made it is delivered from the jiggers. The product so reduced fier, and from thence flows into very flat brick-encased the overflow running into another set of twelve slime as before described. I have proved the residuum to conta quantities, I shall to-morrow take a fair sample from the for assay.

The delivery of the dressed ore from the mine has for tended with much trouble and expense, for the reason that ascent of 250 ft. In less than ¼ mile, with a like decent to the parish road to Penrhyn-coch. To obviate this, we 950 yards of Hodgson's Patent Wire-Tramway along the road. This line consists in the employment of an endless on pulleys, which are carried at a considerable height from posts. The water-wheel last named will drive this rope hour, and it carries with it a series of 24 iron buckets, placed 1 cwt. of lead ore in the ordinary bags. The rope boxes travel on one side of the supports, and the empties The pendents by which the brackets are hung are specially their passing the points of support with perfect ease. ing furnaces shot into a hopper passing to an ore bin farm buildings. I am excessively sorry that the member morrow's meeting will not be able to see this line in wor the bevel-wheels of the driving gear having broken yesterd thought advisable by the tramway company's engineer to of this gearing; this will take a few days, and some new The motive power of the mine is water, which drives six wat dimensions—40 ft., 23 ft., 24 ft., 20 ft., 12 ft., and 8 ft.; in 24-horse power steam-engine is now being erected over No. use in seasons of heavy frost and drought. I have only to in the future of the mine remains unabated. I shall look ere long, and rely that the percentage of cost against the pear more favourable as these new appliances come effective clusion, I have to regret that the accident which occurred more serious in its consequences than was at first anticipated not yet remedied; but I am led to hope that a few days restoration.—J. B. BALCOMBE.

The CHAIRMAN, in moving that the accounts and and adopted, said that he had had the utmost pleasure in the mine, and he hoped that feeling was entertained by could be otherwise than gratified with the improved state of ingenuity and perseverance under which it had all been by Mr. RAMSDALE, and carried unanimously.

Moved by the CHAIRMAN, and seconded by Mr. ARTHUR H usual quarterly dividend of 2*l.* per 100*l.* stock (10000*l.*) be dec 10th proximo."—Carried.

The retiring directors (the Chairman, and A. Birch, Esq elected, and Charles Fauatleroy, Esq., appointed auditor.

Mr. THOMPSON: I see that the balance-sheet gives an ap of the reserves of ore in the mine at 50,000*l.*, which is 10,00 year. I should like to know from the managing director how was computed?

Mr. BALCOMBE: You must not suppose that I contempla turns by an injudicious working away of these reserves. me repeatedly express my determination to act on the corre ciple of proving ore ground at a greater ratio than the re six weeks time the main shaft (No. 3) will be down to 100 the agent in his report tells you that he believes that sec equally rich with the upper ones. However, I have now fo It has been proved that the lode in each section of 10 fms. i downwards, so far as removed, has yielded at the rate of —that is, treating the ore ground as only 20 fms. long, wide, and worth 1½ ton per cubic fathom, or (say) 10 tons By the agent's report it will be seen that the ore ground that the 73 is already 26 fms. west of shaft, the end yield fathom; also, that the lode is opened on 8½ fms. east of shaft length of workable ground in this level 34½ fms. In this the 62 above, there is a very large deposit of ore yet to remo manner, is extended 23 fms. west, and the present end will per cubic fathom. Of the 11 fms. high of lode between puted as containing 220 lineal fathoms, only about 30 fms. away, and the agent will contradict me if I am in error in the mine contains fully 260 lineal fathoms of proved ore g for removal from the 84 upwards at the present time.

Capt. KEMP: There is fully that, Sir.

Mr. BALCOMBE: Well, that 260 fathoms of ground may be per fathom=2600 tons, which should realise (say) 35,000*l.* we expect to see the mine 16 fathoms deeper, or 100 fathoms ing this ground at the same computation (20 fathoms long lise us upwards of 40,000*l.*, which added to the proved valu I, therefore, hope the worthy proprietor is satisfied.—Mr. T

The CHAIRMAN said he had much pleasure in proposing he felt confident would meet with the warmest approval. at the mine to day must feel that they are deeply indebted to rector for the great energy he devotes to the undertaking, improved state of the works. (Cheers.) Doubtless he feels ment that the wire tramway was not able to be started thi was beyond his (the managing director's) control; besides man's) judgment, the cause is of a very trifling character, and medied. In moving, therefore, that the best thanks of the and are hereby given, to Mr. J. Balcombe, for the paternal manner in which he conducts the affairs of the company, b add that, although at the mine less than three months since the pleasurable surprise he felt this morning at the satisfa the work had been completed. (Hear, hear.)

Mr. BALCOMBE: Ladies and gentlemen, I thank you most compliment, and as I have taken up a great portion of your say that the results probable to follow the greatly improv which Bronfloyd is now furnished will, in my belief, prove nerative. We have everything by the forehand, besides wh shortly to come off in the depths of the mine which may prosperity.

Complimentary votes were then passed to the agent (Cap Durie and Davis (Aberystwith Foundry), to Mr. Dingey, jun. the engineer to the tramway company.

Capt. KEMP, in reply, said that the mine never looked b than it did now, and, of course, on the floors the improve enough. Only get the crusher to work again and he would tity of ore which could be reduced.

Mr. DAVIS express d his thanks, and said that the additio the mine was furnished would if to be bought now cost 3 Bronfloyd was not only the best mine in the county, but than any mine he knew of, the day for careless manipulatio ing long since gone by.

The other votes being equally suitably acknowledged, to the Chairman for presiding, and an especial vote to the the meeting, closed the proceedings.

CREEGBRAWSE AND PENKEVIL UNITED MINES.—The report of adventurers, on Monday, pursuant to notice, the accounts to the end of November showed a loss of 327*l.* 6*s.* 7*d.*, and 178*l.* 18*s.* 8*d.* It was resolved that the December wages and charged to the debit of the present account, making the bal venturers 675*l.* 13*s.* 9*d.* A call of 1*l.* per share was made. authorised to work Wheal Henry lode in the south ground best of his judgment; and the matter of the steam-whim deferred meeting. Capt. John James says—"Since I was underground has been an overflow of water from the main, or county adit,

s employed in these mines—On tutwork, 37 men and 29 boys; on tribute, and 6 boys; landers and kibble-fillers, 6; spalling tinstuff, 1 man and surface men, smith, enginemen, &c., 6 men. At the stamps, boys and

[For remainder of Meetings see to-day's Journal.]

FOREIGN MINING AND METALLURGY.

committee of French forgemasters has resumed its sittings, an interval of a year and a half. The railway traffic question, happily abating in gravity, came under discussion, and was long anxiously debated. The general tendency of prices in the French rade is upwards at present; at Paris, however, quotations appather disposed to remain stationary. First-class merchants' as brought upon the Paris market 8*l.* 12s. per ton, with a proporis addition per class. Ordinary plates have realised 11*l.* 12s. per At St. Dinier there has been a good current of business. Rolled made iron has brought 8*l.* 4s. to 8*l.* 12s. per ton, mixed ditto s. to 9*l.* 4s. per ton, and rolled charcoal-made ditto 9*l.* 16s. to er ton. Iron wire has been in active demand. Contracts for ons for telegraphic purposes have been let at Paris; the first lots were secured by the Fraisans Forges Company, and the fifth a Châtillon Company. There is nothing particular to commue this week as to the iron trade in the Meurthe and the Moselle ct. The works of the Marquis de Lambertye, at Cons-la-Grandin the arrondissement of Briey, have been again brought into ity. It is stated that the construction and repairing shops of orthern of France Railway Company at La Chapelle will be ly removed to Fergniers in the Aisne.

e condition of the Belgian iron trade continues excellent; the ipal difficulty with which the proprietors of works have to deal impossibility which they labour under in supplying the wants eir customers with useful and desirable promptitude. One go back a good many years to find a time when quotations so high as at present, or when there was so much activity in all hes of the iron trade. Contracts have been refused this week ore than 10,000 tons of rails to be delivered at the end of the nt year, or the spring of 1873. This refusal has been enforced e principal rolling-mills of the country, especially by the Monsclessin, Couillet, Thy-le-Chateau, Châtelineau, and Seraing s. The managers of none of these works appear disposed to at present upon new long-termed contracts. The establishs for the construction of railway matériel are also overdone with s, none of them being in a position to execute new commands n the periods usually prescribed in contracts. The managers railway plant works have not only to deal with the high prices lling for materials, but they also find it difficult to obtain at roper time such special articles as wheels, tyres, axles, springs, hich are of the first importance to them. These articles are urchased at other establishments, but in future the railway uction workshops will probably endeavour to render themselves dependent as possible by undertaking the manufacture of accesthemselves. Pig appears to be somewhat scarce in Belgium, rices are firm, with an upward tendency. Belgian refining pig cured with difficulty at 3*l.* 14s. per ton; casting No. 6 is worth per ton; No. 3 English sells at 4*l.* 10s. per ton delivered at as nearest to the works; No. 4 has brought 4*l.* 7s. 3d.; speckled, and white, 4*l.* 5s. 6d. per ton. No. 1 rolled iron is quoted 16s., and No. 2 plates at 10*l.* per ton. Contracts for steel tyres ecently let at Bromberg for the East Prussian Railway; the tition was limited to local and English works, but the Engnders were put out of court by the high rates which the firms ring them attempted to enforce. The lowest tenders came Rhenish Prussia. As regards Bessemer rails their present price appear to be established by the results of an adjudication took place a few days since for the Hanoverian State lines. west tender was delivered by the Osnabruck Steel and Iron any, which required 14*l.* 8s. per ton. The average rate of the s was about 16*l.* per ton, which is, of course, very high. Thus gium-Bessemer steel rails could be obtained recently at 15*l.* n delivered at Antwerp, and the Creusot Works delivered simiills last year to the Southern of France Railway Company at hing less than 12*l.* per ton. The remarkable difference indiby these figures is explained by the present plethora of orders, ree. An adjudication for rails has taken place at Bebrader; deliveries to be made at the close of this year at Cassel. nders delivered ranged from 11*l.* 18s. 6d. to 11*l.* 19s. 6d. per A contract for the superstructure of an iron bridge for the and Hanau Railway was let to M. F. V. Dreyse Sommerda at s. per ton; this rate included the cost of carriage and erection. asse-Sambre United Collieries Company will pay a dividend rch at the rate of 1*l.* per share.

Charleroi coal miners' strike has terminated; it has done the oalowners no harm, as it has enabled them to run off the stocks had accumulated in consequence of the inadequacy of the g means of transport. Some rather important transactions been concluded in the Charleroi basin at somewhat higher rates. ate of the coal trade in France is less favourable than in Belat the same time, it is not altogether bad. Prices display firmness, but they exhibit no appreciable change. The produce of the German State coal mines at Saarebruck was rather less n either October or November. The stocks of Saarebruck coal nd at the close of last year were not very large. The deliveries by railway declined in December to 166,700 tons, as compared 75,000 tons in November. About 84 per cent. of the coal trucks d for the district have now been delivered. The arrivals of from the Palatinate, Alsace, and France have been someinadequate to meet the demand which has been experienced those quarters. The production of the Sarrebruck basin dure last three years has been as follows:—

	1869.	1870.	1871.
First half-year..Tons	1,622,768	Tons 1,835,579	Tons 1,477,446
Second half-year	1,822,526	898,439	1,726,520
Total.....	3,444,894	2,734,018	3,203,9 6

fluence of the late severe conflict between France and Germany e readily traced in the figures relating to the last three half-

Havre, Chilian copper in bars has made 87*l.* to 88*l.* per ton; reitto, in ingots, 82*l.* 8s. to 84*l.*; Peruvian minerals (pure standard), 72*l.*; United States (Baltimore), 76*l.* to 78*l.*; ditto (Lake Supe92*l.* to 94*l.*; ditto, Mexican and Plata in bars, 66*l.* to 68*l.* per A considerable business has been passing in tin upon the Dutch ts. Banca, as well disposable as for future delivery, has made to 87 fls., while Billiton has realised 84 fls. to 86 fls. The last for disposable Banca were 85½ fls.; ditto for Banca to be del at the approaching sale, 86 fls.; ditto for disposable Billiton, At Paris, Banca, to be delivered at Havre or Paris, has made Straits, to be delivered at Havre or Paris, 156*l.*; and English, delivered at Havre or Rouen, 156*l.* per ton. There has been no al change in lead or zinc.

D IN NEW ZEALAND.—From Wellington (Nov. 26) we learn that d of our gold fields continues to increase, and the proposed expenditure ool. on water races will no doubt contribute to their development. The g needful in gold mining is water. The precious ore is found intermixed avel, sand, clay, soil, and other *debris*, technically known as "wash The secret of their separation consists in the fact that gold is heavier y of the substances with which it is intermixed, and when the mass is in water or dashed by a sluice, the gold falls to the bottom, and the aterials are washed away. Without a copious supply of the pure elething can be done, and as the strata in which the gold is found are les away from water, it has to be brought to the spot by means of races les in length, and in the construction of which large capitals are in-It is to aid in the construction of these races that the Government propriated 200,000*l.*, which will be allotted in proportion to amounts to d by private enterprise. The work will be eminently reproductive, as old fields will be worked which are now beyond reach of water.

H.—A correspondent, writing from Salt Lake City (Jan. 6), "the Red Warrior lode in Utah Silver Mines is 8 ft. wide, in *solid* galena cent. lead, and $24 silver to the ton.

A.—Prof. Silliman, writing to a friend in England, says that report was written, and up to the present time, he is advised by those ine that the reserves are in the greater part intact, the daily supply of out 50 tons) being drawn chiefly from new and virgin ground, opened in f exp orations advised by Prof. Silliman. It is understood to be the the new management to follow the advice of Prof. Silliman—to hold intact the great body of their reserves and push on new explorations in virgin ground—a policy which has already richly rewarded them, and is the only safe policy in any mine. So far as the mine is concerned, it is truly surprising in its productiveness.

REPORT ON THE MENZENBERG MINE.

Jan. 31.—The Dickens shaft has been sunk 4 6-10 lachters. The shaft is, for the most part, in lodes. Two lodes, before known as parallel lodes, have crossed the shaft from east to west, and it is certain that they improve in depth, both in size and richness of ore. Under these parallel lodes another lode has been discovered, running about east and west. This lode was when first seen about 10 in. wide, but increased in sinking to 3½ ft.; it has produced very rich grey and red oxide of copper. We have raised this month 66 Prussian tons, of 1040 lbs. each, or about 33 English tons of copper ore. One man has been employed for 16 days of 12 hours each in dressing ore, and has prepared 3720 lbs. of No. 3, in the lowest quality ore of from 6 to 7 per cent., and has selected out the No. 2 and No. 1 qualities, to be dressed hereafter.—Münchberg Adit: The adit has been driven 2 6-10 lachters, and the adit level has been driven on the lode 2 6-10 lachters. A side level has also been driven to prove the lode 5 5-10 lachters, which side level is stopped.—Joseph Shaft: Here a new ladder road or way has been fixed, and the shaft repaired; a tip for receiving deads, &c., cut, and a cistern to receive the water from the cross-cuts, whence it is pumped to surface. Yesterday the sinking under the level of the cross-cut was commenced, and it is calculated that these lodes will be seen at their junction in from 10 to 12 weeks.—SCHREINER: Menzenberg.

Report of HERRN ZINKRAFT, of Bonn, Inspector and Surveyor of Mines to the Prussian Government, on the Menzenberg Mine:—

Jan. 31.—The mining grants or concessions consolidated under the name Menzenberg, lie in the Government district of Honnef and the mining district of Unkel. South of the Menzenberg concession lies the St. Josephsberg Mine; on the north the mines of Alter Frits and Eva. The main operations are, for the moment, concentrated on sinking a shaft distant about 55 lachters north-east from the Menzenberg house; the shaft is 9 ft. long by 4 ft. wide. The haspel on the shaft is about 16 lachters over the adit level behind the house at Menzenberg, and it is intended when the shaft has been sunk to the above-mentioned adit level to drive an adit level north-west, which will reach the shaft in 60 to 65 lachters driving. The shaft is now 10 1-10 lachters deep. In sinking the shaft at the depth of 3-10ths of a lachter under the surface a lode was discovered with an underlie of about 59°, and running nearly north and south; after sinking 4 2-10 lachters the lode was passed through out of the western side of the shaft. At this depth some old workings were met with, and on close inspection two cross-cuts, one to the east, the other to the west. In the eastern cross-cut, by clearing 3 lachters, a lode north-west by west was opened on, and 4 7-10 lachters still further east a similar and parallel lode, with a like underlie of 60° to the eastward was seen. In the western cross-cut three lodes were met with, the first running to the north and south, and underlying to the west, the second north-east and south-west, and the third parallel to the last referred to, with an underlie similar to it of 70° to the east. These lodes have not been further worked on, since the so doing would have impeded the sinking of the shaft, and further search for them will be attended with much better results at a greater depth. Near the present bottom of the shaft a new east and west lode has been discovered, with an underlie of 21° south. In sinking the shaft ore has almost immediately and uninterruptedly been met with. The first opening of the mine appeared to promise these results, but the lode now opened up contains very rich ore, much superior in quality to the ores first discovered. The lode came into the north side of the shaft about 6 in. thick, and in sinking on it 1 lachter it reached a thickness of 3½ ft. In this lode the ore is indeed very fine; 10 to 12 in. will, according to my calculation, contain at the very least from 15 to 18 per cent. of copper. As most of the before-mentioned lodes opened upon are quartz the ores are mostly malachite, kupferlasur (blue carbonate of copper), ziegelerz (red oxide of copper), kupferpecherz (pitch copper, little known in England); black oxide, grey sulphuret of copper, and yellow sulphuret of copper are also in the last-mentioned lode. After the before-mentioned openings I am authorised to say that the mine promises to be a most prosperous one, also that the ore is in the same line as the St. Josephsberg; the ore is similar, and there is every reason to believe that it will be found the same as at St. Josephsberg.

FOREIGN MINES.

SOUTH AURORA (Silver).—The directors have advices, dated Jan. 4 and 12, announcing the shipment of three bars of bullion, value $3,016 92·100, being the first remittance from the tailings.

SWEETLAND CREEK (Gold).—A telegram from the superintendent, Mr. M'Lean: "We have cleaned up, after a run of 38 days. The gross returns are $13,500; the profit is $7000. The tunnel cost during the run has been $900. I send you a remittance of $6000.

PACIFIC.—Capt. H. Prideaux, Jan. 5: During the past week we have raised from the mine 20 tons of ore, and shipped to the mill 31 tons 9 cwts. 43 lbs., estimated value $80 per ton; 3 tons 8 cwts. 60 lbs., value $300 per ton; 15 cwts. 10 lbs., value $1000 per ton: total, 35 tons 13 cwts. 13 lbs. There is no alteration since my last to report upon. The mine operations are progressing satisfactorily. The Mettacom mill is regularly working. Our new rotary furnace is giving every satisfaction.

— Capt. H. Prideaux, Feb. 7: *Telegram:* Production in the past week, $3500. Batters' ledge looking rich.

UTAH.—J. R. Murphy, Feb. 8: *Telegram:* Advices forwarded. Communications eastward blockaded seventeen days. Pushing work vigorously. Red Warrior, 17 feet solid mineral, 40 feet deep, showing beyond expectation. Must suspend unless funds be sent forthwith.—Just previous to the receipt of this telegram the board had paid the amount owing in Salt Lake City, and remitted funds to Mr. Murphy on account of working expenses.

CLIFTON.—Extract from the agent's weekly report, Jan. 20: Clifton shaft No. 1 has been sunk about 6 feet. The vein is gaining power and width, and is now altogether 9 feet thick, consisting of ore, ore ground, and gossan, which is strongly mixed with mineral; taken altogether the appearance of the vein at this point is very encouraging. Clifton top level has advanced 15 feet, and has struck the ore-bearing ground. In the coming week I think we shall get good ore here.—Rara Avis Shaft: Both the east and west drivings have improved considerably. The west end has advanced 12 feet, and the east 4 feet. The west driving has improved to such an extent that I think we shall be justified in making a surface level opening at the depth of the shaft, and on a level with these two drivings; this will afford easy and economical means for working at this point, where we can open out an immense extent of mining ground, and run the ore out at a small expense. I am strongly of opinion that our great work on the mine must be done by means of tunnels and levels, and I shall be glad to know if this opinion is regarded with favour by yourself and the board. Ore raised: Clifton No. 1, first class, 6 tons at $120=$720; ditto, second class, 10 tons at $30=$300; Rara Avis No. 1, first class, 5 tons at $120=$600; ditto, second class, 7 tons at $30=$210: total, 28 tons, value $1830.

PESTARENA (Gold).—The directors announce that the return of gold from Val Toppa for the month of January amounted to 258 ozs., from 584 tons of ore.

PINTO (Silver).—The directors have a telegram from the superintendent at the mines, advising a further shipment of silver bars, of the value of about 1200*l.*

LANESTOSA.—Feb. 3: The weather having improved lately, we have got all the exploratory works in full operation, and trust to be able to keep them so, with but short intermissions.—La Mora: At this place a couple of men have been working during the past month, raising calamine from several veins. In the works called La Clara 2½ tons were raised, and the men will continue this for a little time.—Esperanza: Here we have nothing doing, but in the tribute pitch for calamine at south end of Soberante Works, the ore is sparsely distributed between the division line of two strata, and the men have to follow the small veins that open up; they raise on an average 6 to 8 tons per month.—Agustina: At Bascula shaft sinking and clearing (for the work partakes of both new ground having to be carried down with the old shaft) continues without interruption, and we have got down 20 metres. The old shaft seems crushed, and filled through its whole depth, and it is, therefore, not likely that we shall benefit in any way by it—Santa Lucia: The landslip at inclined level has been cleared, and the men are again working in the end and stope, both of which are yielding calamine and lead, and looking most promising. In the end a cave, or cavity, has lately been opened into, around the sides of which good blocks of carbonate of lead, galena, and calamine have been broken, the cavity appears to extend beyond the level, with every sign of leading into a good deposit of ore. A whim, or other similar machine, will have to be put up at once to get away the stuff.—Asuncion: At Santa Matilda shaft some men were put last month to extend a trial level northwards, and in this place old works were holed into, and a good branch of calamine was discovered, which will now be taken away on tribute. The ground is hard, but I think wages will be earned at 15s. per ton for calamine, and 4*l.* 5s. for lead.—Gianrafon: In the deep adit here the lode has lately been intersected, and the adit is now being driven on it; the lode is not rich, but of a very promising character, it is about 1 metre wide, composed chiefly of carbonate of lime, shale, and earthy matter, with occasional spots of lead. The ground is very easy, and good progress will be made, so that we may soon expect to get under the hill, where the lode is worked largely at surface, and where something of its character will be seen.—Aurora: Both the deep level (and adit) and the cross-cut from shallow adit are being followed here without change, the ground in the latter being very hard.—La Flora: The same remark upon the ground may be made with respect to the deep adit at this mine, and very little has been driven; the rock is full of pyrites, which I have not seen in any other mine here. I find from measurement that there are some 6 metres more to cut the lode.—La Luisa: At Ventura adit the ground has slightly improved; we have now about 20 metres more to reach the lode, on which we purpose driving. In Cubello adit we appear to be reaching the bottom of the ancient workings, and I hope soon to be able to report that we are working on the unbroken lode. The weather has prevented the masons finishing the house at this mine, but there is every prospect of its being concluded quickly now.

ALAMILLOS.—Jan. 31: The 60, west of San Rafael's shaft, is larger than it has been for some time past. In the 50, east of La Magdalena shaft, the ground is hard for driving, and the lode small and poor. The lode in the 75, east of Taylor's engine-shaft, continues very small and poor. In the 85, east of Taylor's engine-shaft, the lode is large, with spots of ore, and letting out much water, producing ½ ton of ore per fathom. The lode in the 85, west of Taylor's engine-shaft, is very wet, and difficult to drive through. In the 50, west of San Adriano's cross-cut, the lode is of no value. The lode in the 50, west of San Yago's shaft, is getting larger and more open than it has been for a long time past. The 40, east of San Victor's shaft, is holed to Felipe's winze, east of which it is being driven; the lode looks kindly, worth 1 ton of ore per fathom. The 50 cross cut, south of San Victor's shaft, has just intersected a wide and strong lode, containing a little lead. The lode in the 40, west of San Victor's cross-cut, is very changeable, and at present only contains stones of ore. In the 20, east of Addis's shaft, the lode has improved, and is now opening tribute ground, worth 1 ton of ore per fathom. The lode in the 40, east of Crosby's shaft, is larger than usual, and hard for driving, producing 1½ ton of ore per fathom. In the 50, east of Crosby's shaft, the lode is of an open and promising appearance, producing 1 ton of ore per fathom. The 50, east of Crosby's cross-cut, opened good ore ground in the first half of the month, but is poor at present. The 50, weft of Crosby's cross-cut, has passed through a good length of rich ore ground, worth 3 tons per fathom. The lode in the 40, west of Crosby's cross-cut, is rather small at present, worth 1 ton of ore per fathom.—Shafts and Winzes: In Sebastian's winze, below the 40, the lode has become small and unproductive. In Rica's winze, below the 30, the increase of water renders the sinking very difficult, producing 4 tons of ore per fathom. Felipe's winze, below the 30, is holed to the 40, yielding 1¼ ton of ore per fathom. Lazaro's winze, below the 40, is going down in a very fine shoot of ore, worth 3 tons per fathom. The tribute department produced a large quantity of ore in the past month, and the stopes are looking well at present. The inclement weather has greatly retarded all surface work. The machinery is in very fine condition. We estimate the raisings for February at 225 tons.

LINARES.—Jan. 31: Pozo Aucho Mine: In the 85, west of Crosby's shaft, the granite is very hard, and the lode small. There is no improvement in the 75, west of Crosby's shaft. In the 75, east of San Francisco shaft, the lead-bearing part of the lode is very small at present, yielding ¼ ton of ore per fathom. The 75, west of San Francisco shaft, is opening tribute ground worth 1 ton of ore per fathom. The lode in the 65, west of San Francisco shaft, is small and the granite excessively hard for driving through. The lode in the 55 fm. level, west of San Francisco shaft, is very compact and regular, worth ½ ton of ore per fathom. The 45, east of San Francisco shaft, is quite unproductive. The tribute department yielded very well in the past month, and the principal stopes have not undergone any unusual alteration. The weather has been most unfavourable for surface work. The pumping machinery is fortunately in excellent condition, consequently we are not inconvenienced by the increase of water, beyond an additional consumption of fuel. We estimate the raisings for February at 300 tons.—Quinientos Mine: In the 65, driving west of Taylor's engine-shaft, the ground is exceedingly hard for driving, and the lode of no value. The lode in the 55, west of Taylor's engine-shaft, is not so productive as it was a short time since, yielding 1 ton of ore per fathom. In the 65, east of Taylor's engine-shaft, the lode contains spots of ore. The 55, east of Taylor's engine-shaft, continues unproductive. The lode in the 45, east of Addis's shaft, is large and strong, with good lumps of ore, worth ¾ ton per fathom. The 32, east of Henty's shaft, is opening splendid ore ground, worth 3 tons per fathom. The lode in the 32, west of San Carlos shaft, is of a very promising appearance, and is likely to improve until it holes to the last-named end, yielding ¾ ton of ore per fathom. In the 45, west of San Carlos shaft, the lode produces very good stones of ore, worth ½ ton per fathom. In the 55, west of San Carlos shaft, the ground is hard for driving, and the lode small and poor. The lode in the 55, east of San Carlos shaft, is very wide and open, consisting of decomposed granite, carbonate of lime, and lumps of lead ore, yielding of the latter 1 ton per fathom. The 45, east of San Carlos shaft, is in old works; the excavation is narrow, and easily cleared. The 32, east of Judd's shaft, is also in old works, at present very wide, rendering the securing of the level a difficult matter.—Winzes: The lode in Salvador's winze, below the 32, is small, at present yielding ½ ton of ore per fathom. In consequence of the floods, Perez' winze, below the 32, is full of water. The lode in Garcia's winze, below the 45, has a promising appearance, but is not so productive as it was, yielding 1 ton of ore per fm.

FORTUNA.—Jan. 31: Canada Lucosa: The lode in the 110, west of Henty's shaft, is large and rughy, with a great deal of calcareous spar and oxide of iron, producing 1¼ ton of ore per fathom. The 100, west of Henty's shaft, has greatly fallen off in value since last report, but it is again improving, worth ¾ ton of ore per fathom. The 80, south of Henty's shaft, is suspended, and the men put to drive south and west. The 60, east of San Pedro's shaft, is opening up a very valuable piece of ore ground, worth 3 tons per fathom. The lode in the 90, east of Addis's shaft, is small, and the ground hard for driving. In the 80, west of Lowndes' shaft, the lode is large, and of a very promising character, worth 1 ton of ore per fathom. We expect an improvement in the 80, east of Lowndes' shaft, shortly, as the winze sinking in advance is in a good course of ore.—Shafts and Winzes: Judd's shaft, below the 90, is holed to the 100. We hope to have all the pitwork completed in Lowndes' shaft, below the 80, by the latter part of this week. Serrano's winze, below the 70, is going down in a very productive piece of ore ground, worth 2 tons per fathom. We have resumed the sinking of Picon's winze below the 100, which produces 2 tons of ore per fathom.—Los Salidos: The lode in the 110, west of Buenos Amigos shaft, is compact and regular, yielding 1¼ ton of ore per fathom. In the 100, west of San Carlos shaft, we have had a good stone of lead since last report, but the lode is again small, worth ½ ton of ore per fathom. There is a small branch of lead in the 90, west of San Carlos shaft, but not enough to value. The lode in the 75, west of San Carlos shaft, is small and poor. The lode in the 110, east of Buenos Amigos shaft, is divided into small branches, producing 1 ton of ore per fathom, and we expect a strong cross-course shortly. The lode in the 110, east of Morris's engine-shaft, is improving, and is looking much better than for some time, worth 1 ton of ore per fathom. The lode in the 100, east of San Pablos shaft, is compact, and the ground hard for driving, worth 2½ tons of ore per fathom. In the 90, east of San Miguel's shaft, the lode is divided into two solid branches, worth 2½ tons of ore per fathom. There is a good lode in the middle of the 35, west of Palgrave's engine-shaft, but the upper and under parts are not so good, producing 1 ton of ore per fathomr In making the 25, west of Palgrave's engine-shaft, good we find that the former workers have gone below at this point. In the 35, east of Palgrave's engine-shaft, the part of the lode is small, and the water is issuing out freely.—Winzes: The lode in Jordan's winze, below the 100, is small and regular, and the ground moderately easy for sinking, producing 1 ton of ore per fathom. The ground is very hard in Agustin's winze below the 100, yielding ½ ton of ore per fathom. The lode in Medina's winze, below the 25, is divided into several branches, and is wet and troublesome for sinking, producing 1¼ ton of ore per fathom.

WEST CANADA.—Jan. 10: At the Wellington Mine we have two stopes in the bottom of the 40, east of Bray's shaft, in each of which the lode is yielding 2½ tons of ore per fathom.—Huron Copper Bay: The lode in the 60, east of Bray's shaft, continues to yield 1½ ton per fathom. In the cross-cut driving north at the 50, west of Palmer's shaft, we have lately cut a branch about 6 in. wide, containing a little ore. In the stope in the back of the 60, east of Bray's, the men are opening on the lode, which will be valued in our next report; the lode is worth 2½ tons per fathom. In the stope below the 50, west of Palmer's shaft, and also in the two stopes in the bottom of the 35, east of Bray's shaft, the lode is worth 3 tons per fathom. In the stope below the 35, west of Palmer's shaft, and 2½ tons in the stope under the same level, west of Bray's, on Fire lode. In the bottom of the 20, east of new engine-shaft, the stope yields 2 tons per fathom. We are about to resume the sinking of Bray's shaft, and are now engaged in cutting ground, putting in dams and pent-house.

CAPE (Copper).—By the Norseman bills of lading are received for 537 tons of copper ore per G. I. Jones, 46 tons of regulus, 17 tons of copper ore and 3 tons of metal per Norseman, and 41 tons of copper ore per Northam. The William Graham and America arrived at Port Nolloth on Dec. 11, and would load together about 700 tons of ore for Swansea. [Since last report 33 tons of ore have been sold by private ticket, at 16*l.* 9d. per unit, realising approximately 704*l.*: 341 tons, ex Lynwood and Roman, and 79 tons of regulus, ex Cambrian and Roman, have been put forward for sale by public ticket on Feb. 27.]

[For remainder of Foreign Mines see to-day's Journal.]

MINING ON THE PACIFIC SLOPE.

EAST SHEBOYGAN.—Connection is made between the South Original tunnel and the north shaft, and all the works of the mine are ventilated. Two drifts, one to connect the Exchange and Original drifts, and the other turning east. There are about 1500 tons of ore on the dumps, and the manager estimates that there are 24,000 tons of ore in sight in the different openings. The last crushing-out of ore turned out $95 to the ton, pulp assay. A force of 24 men is employed at present in and about the mine, and the same number will be employed during the winter breaking down ore and hoisting it to the dumps

NORTH AURORA.—Since the tramway started with the new cable the ore that accumulated on the dumps of the Risdale chamber is being shipped to the International mill. The ore in this chamber holds out in quantity and grade. The south drift in the Lady's chamber still shows an extensive body of ore (much of it assaying high), and the body increases as the chamber is opened.

EBERHARDT.—Stormy weather prevents work in the open cut. The drift from the Keystone shaft is going ahead as usual.

SOUTH AURORA.—The main lower tunnel is pushed rapidly ahead by contract. Mr. McDonald, foreman of the South Aurora Company's mines, is of opinion that the tunnel will tap the mineral belt about April 1.

ICEBERG.—This mine turns out over average milling ore. At present the ore is hoisted and piled on the dumps, for shipment to mill when the storm subsides. The whole underground force of miners is employed breasting out.

WARD BEECHER.—The ore in the east end of the mine is of a fair milling quality, and holds out the usual body. The proceeds of the mines for the year will foot up nearly $2,500,000; and had several of the prominent mines—now, and for the past four months, doing dead work for the purpose of prospecting and making openings—been operating in ore, the turn-out of bullion would have reached $3,000,000.

CAMP FLOYD.—The Silver Cloud Company are employing a large force, and are taking out a steady supply of fine ore. They find it better the further they go. All the mines on the Silver Hill side of the canon prove to be of immense extent and richness the further they are developed. The Camp Floyd Mining Company have struck large bodies of horn silver on the Last Chance and Sparrow Hawk. I should estimate the ore in sight at the mouth of the tunnel on the last-named mine to be worth at least $20,000 without entering the tunnel or counting the ore piled on the dump. The Last Chance shows plenty of horn silver and sulphurets in almost every piece of their quartz. These mines have been opened recently by three new tunnels, and all show the most unmistakable signs of paying ore within. The peculiar formation of this vast vein or deposit of ore presents the most favourable opportunities for working by tunnels. So far as has been proved, the vein has a dip of only about 18° or 20° towards the north, with a slight dip to the east, so that a tunnel run in a north-westerly direction will have an almost level course, from which side entries can be run north and south. —*Scientific Press* (San Francisco, Jan. 13).

THE PRODUCTION OF COPPER ON LAKE SUPERIOR.—It has been assumed that the production would be about 400 tons less in 1871 than in 1870. According to the estimates this is a mistake, and the deficiency will not be much over 100 tons. The total amount produced in 1870 was 16,188 tons, and in 1871 16,076 tons, being about 104 tons less for this year. The moneyed value of the copper and iron product of Lake Superior for 1871 is about $12,000,000. The total product of the iron mines of Lake Superior for the past year will reach nearly 1,000,000 net tons of ore, while the make of charcoal pig-iron will be over 40,000 tons.—*Wall-street Journal* (U.S.)

LIGHTING RAILWAY CARRIAGES WITH GAS.—By the invention of Mr. WILLIAM HOLLINSHEAD, of Peckham, the manufacture of gas for the supply of a train may be made in one or more of the carriages, from oil, or other liquid gas producing substance, by means of the following apparatus, which consists of a retort, by preference of a peculiar form, divided into compartments and set in brickwork, the carriages being protected by metal plates. The oil is supplied from a cistern placed above the retort, and regulated by means of a ball-cock connected to an oil reservoir. A certain proportion of water is admitted with the oil, to prevent carbonaceous deposit. The gas passes from the retort to an annular condenser, and from thence to a counterbalanced gas-holder, which is in the form of a parallelogram, and guided by four internal guide rods within seal tubes attached to the holder. The tank is also of annular construction. By a series of levers attached to the holder and feed cocks the supply of oil to the retort may be regulated. The gas is conveyed to the burners by metal and flexible tubes, and a regulator is applied to each carriage.

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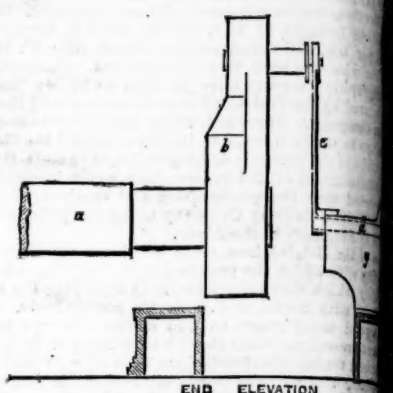

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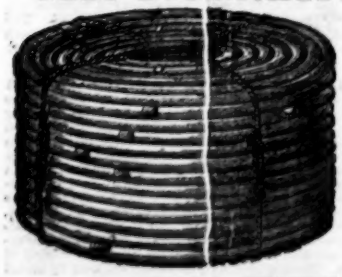

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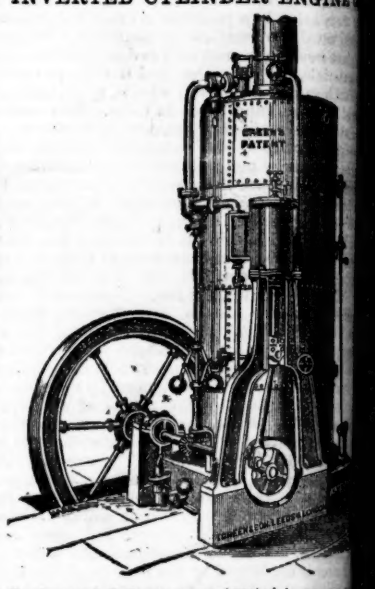

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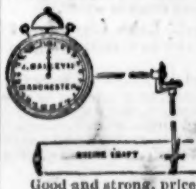

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